MECHANICAL ADJUSTMENT

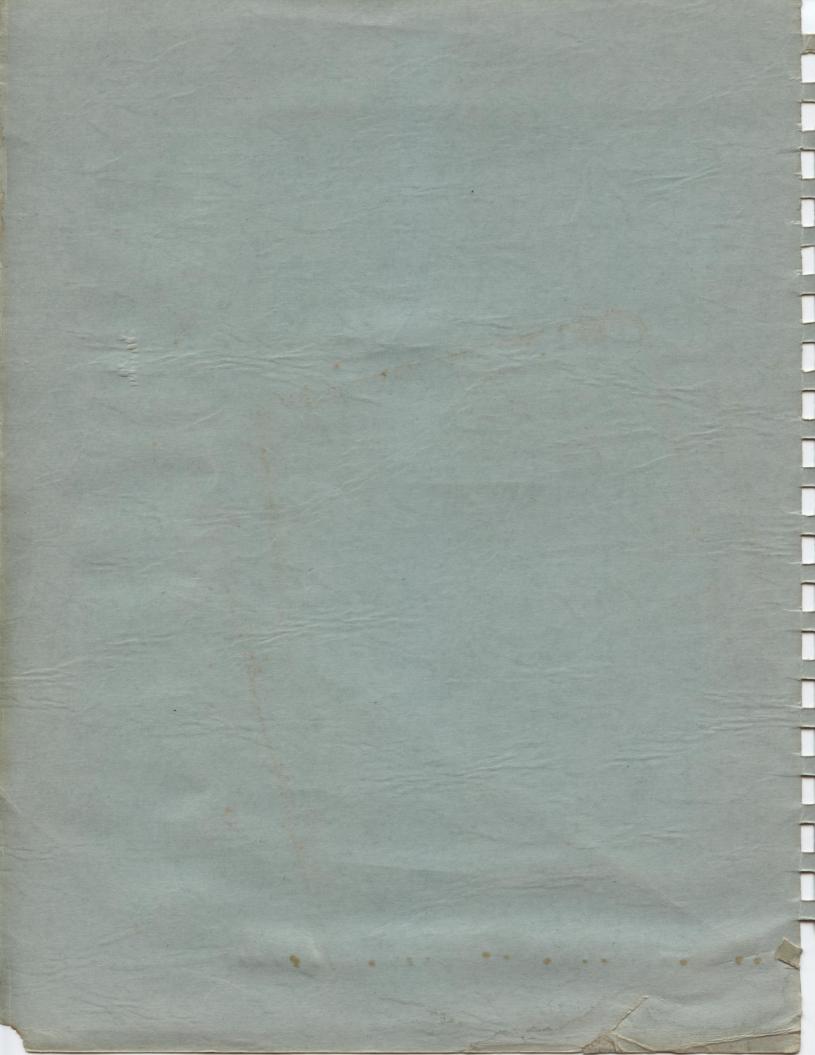
Function, Testing, Lubricating & Parts Reference Data



Printed in U.S.A. DECEMBER 1947

MONROE CALCULATING MACHINE COMPANY, INC.

General Service Department, Orange, New Jersey, U.S.A.



Foreword

This bulletin illustrates and describes the functions and adjustments of the full automatic mechanism of the CAA-10 model, thereby obsoleting Section C of Machine Service Bulletin 440. Sections A and B are obsoleted by Machine Service Bulletin 440-D #1 containing explanations of operating controls and mechanical functions.

Forty-eight drawings in color are contained in the 131 pages which comprise this bulletin. Supplementing the detail drawings, five special reference illustrations are included to show complete sections and movements. These, in larger size, may be requisitioned separately for shop instructional purposes.

Considerable concentrated study and experience is required before attempting to service this model, especially in connection with the mechanism employed in relaying the cycling, tripping, shifting, and clearing impulses through the machine.

Identification letter symbols on illustrated pages are arranged in a directional sequence to facilitate locating same when reference is made to them in conjunction with text on preceding pages.

The terms "left-hand", "right-hand", "forward" and "rearward" refer to the machine in the normal operating position as viewed by the operator.

Part number identification of various alphabetical symbols used as reference with illustrations for instructional purposes is listed on pages 128 to 131.

Assembling aids are contained in Machine Service Bulletin 441 together with complete parts and assemblies data.

All offices receiving this bulletin should sign and promptly return the attached receipt card.

CONTENTS

Subject										1	Page
Subject Foreword									1		1
Sectional Index											
Graphical Index											
Function and Adjustment Detail		. 4									4-99
Lubrication and Cleaning											
Kit Tools											
Sequence of Adjustments											102-113
Operating Tests											
Special Reference Illustrations.											122-127
Part Numbers of Symbols											

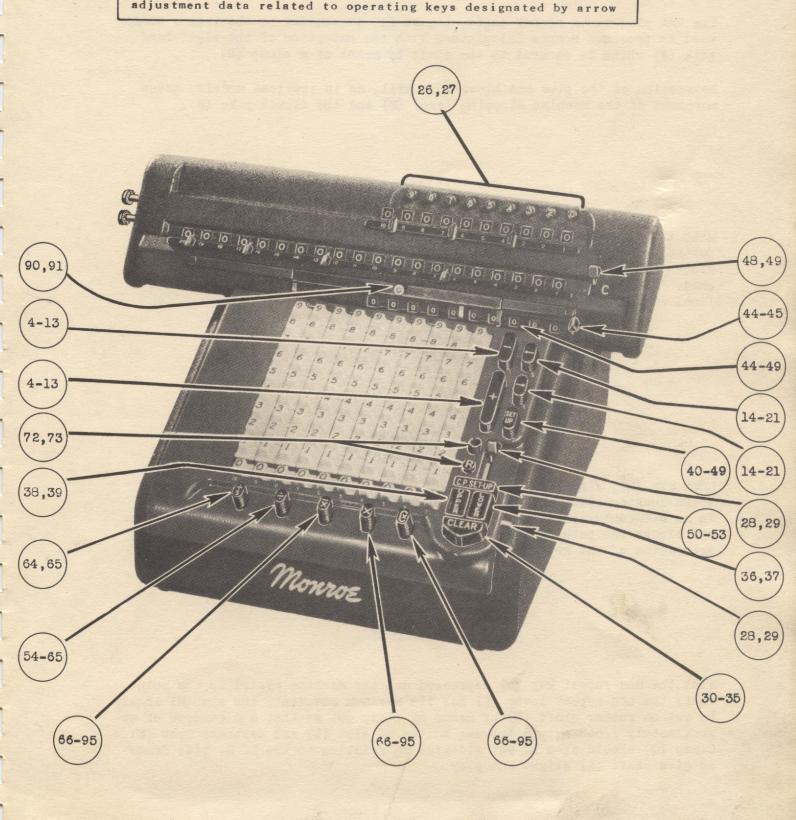
INDEX

Mechanism		Page
Plus Key		4, 5, 6, 7, 8, 9, 10, 11, 12, 13
Minus Key		4, 5, 6, 7, 8, 9, 10, 11, 12, 13
Shift Key R.H		14, 15, 16, 17, 18, 19, 20, 21, *
Shift Key L.H		14, 15, 16, 17, 18, 19, 20, 21, *
Carriage (Setting)		22, 23, 24, 25, 26, 27
Tabulator Keys		26, 27
Change Lever (Carry Counting)	. 1000	28, 29
Clear Key (Keyboard)		30, 31, 32, 33, 34, 35
Clear Key (Lower Dial)		36, 37
Clear Key (Upper Dial)	13.41	38, 39
Set-Up Key	•	40, 41, 42, 43, 44, 45, 46, 47, 48, 49
C.P. Set-Up Key		50, 51, 52, 53
Division Key		54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65
Multiplication Keys (Three)	•	66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95
Clearing (Automatic Division & Multiplication)		94, 95, 96, 97
*Forming Detail of Spiral Stop Latch		98, 99

Monro Matic

GRAPHICAL INDEX

Numbers within circles designate pages containing function and adjustment data related to operating keys designated by arrow



The CAA plus-minus rocker shaft, Figure #1, is similar to the rocker shaft used in previous Monroe Calculators with the exception of the right-hand fork (F) which is secured to the shaft by means of a clamp (E).

Depression of the plus and minus keys will, as in previous models, cause movement of the machine stopping lever (B) and the clutch yoke (C).

ADJUSTMENT

With the plus and minus keys limited upward in neutral and screws (G) adjusted inward evenly, latch (A) should be positioned in slot (J) of the clutch yoke positioner (H). This adjustment is made with clamp (E) loosened. After clamp (E) is tightened securely, screws (G) may be set for final adjustment of latch (A) in slot (J).

FUNCTION

Lock arm (M), Figure #2, is provided for the purpose of holding the key-board locking slide (K) to the right while the machine is cycling or is in an off-center position. When the machine is off-center, arm (M) raises and blocks the path of locking slide (K), thereby preventing release and depression of the keyboard keys.

ADJUSTMENT

With the non-repeat key (N) depressed and the machine cycled to the point where the non-repeat lever (P) has its maximum movement, the arm (M) should be set on rocker shaft (R) by means of clamp (Q) so that a clearance of approximately 1/64" exists between bottom of slot (L) and keyboard lock (K). Clamp (Q) should also be set sidewise in relation to the L. H. side frame to give shaft (R) slight end play.

Turning of intermediate gear (S), Figure #3, will move the trip lever adjustable tip (W) downward. This movement of the trip lever (T) will cause its flexible end (Z) to release and raise above the cycle stopping latch (Y). The cycle stopping latch (Y) is also tripped on each non-repeat cycle through the action of cam (FF) on lever (GG) causing lever (P) to move lever (EE). This movement is transferred to lever (CC) on left-hand side of keyboard. The forward movement of (EE) moves cam (DD) downward causing linkage (U) to pivot at screw (AA) moving (Z) upward releasing the cycle stopping latch (Y). This same tripping movement occurs during each set-up cycle by means of a similar movement of lever (P).

ADJUSTMENT

With intermediate gear (S) turned so that adjustable tip (W) has its maximum downward movement, loosen screws (X) and adjust flexible end (Z) to raise 1/32" above (Y) without cramping and retighten screws (X).

When the non-repeat key is depressed and the machine is cycled to the point where the non-repeat lever (P) has its maximum movement, the flexible end (Z) should be adjusted by bending arm (BB) upward or downward to raise flexible end (Z) 1/32" above cycle stopping latch (Y). This adjustment should be checked with the carriage located both in and out of its #1 position. (#1 position = carriage to extreme left)

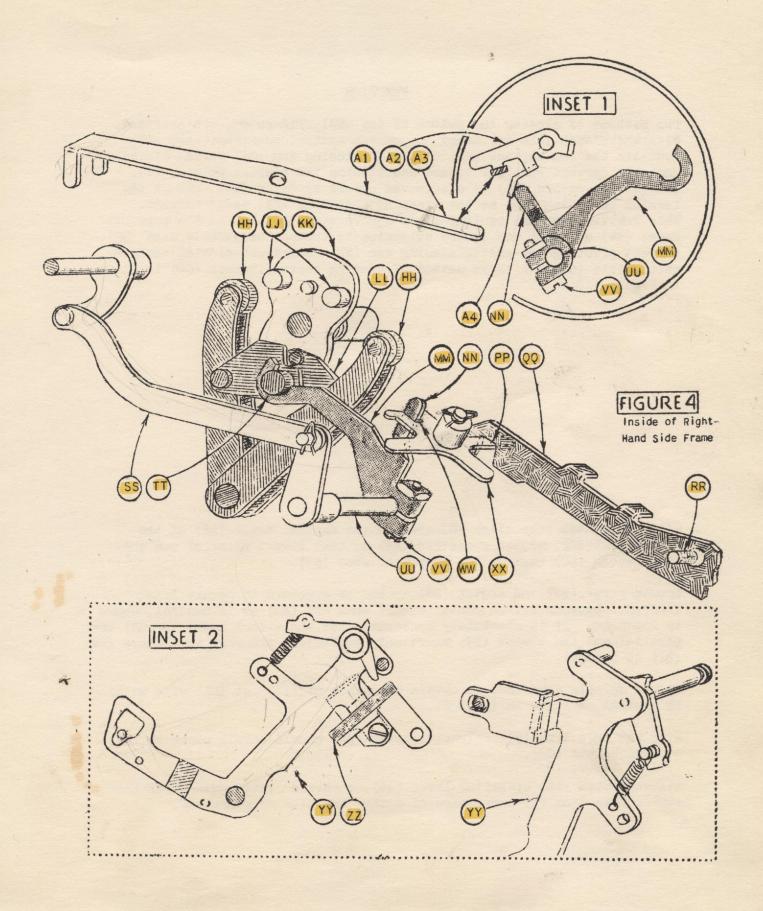
Lever (CC) should be adjusted to have rubbing contact with the top of the notch in the left hand side frame without binding. Loosen screws (V) and adjust (U) forward or rearward so that when the multiplication key is latched downward, trip lever (T) should be fully divorced from its flexible end (Z). When the multiplication key is restored, trip lever (T) should be fully coupled to its flexible end (Z).

The machine is located in neutral by the action of rollers (HH), Figure #4, on the cam surface of (KK). As the machine starts to revolve, the locating toggle is "made" by studs (JJ) pushing down on toggle arm (LL). The "making" of this toggle prevents the rollers (HH) from contacting cam (KK) as the machine revolves. On every bumper stroke, arm (SS) is driven forward raising toggle breaking arm (MM) upward. The upward movement of this arm "breaks" the toggle slightly and further movement of the arm engages stud (TT) preventing the rollers (HH) from contacting the locator cam until the cycle stopping arm (YY) moves away from the bumper (ZZ). This same raising of the toggle breaking arm (MM) causes its upward extension (NN) to move into the slot (WW) to neutralize the shift reversing rocker (XX). This same upward extension also contacts the lower off-set (A4) on latch (A2) and raises it high enough to release the right hand extension (A3) of the yoke throwing arm (A1).

ADJUSTMENT

Each time that the cycle stopping arm (YY) moves to the bumper (ZZ), the locator toggle arms (LL) should be "broken" by the upward movement of the toggle breaking arm (MM). When the cycle stopping arm (YY) is against the bumper pad, extension (NN) of toggle breaking arm (MM) should be positioned in slot (WW) of reversing rocker (XX) without bottoming. Adjust arm (MM) on rocker shaft (UU) and tighten screw (VV) securely. Do not permit any end play in shaft (UU). Extension (NN) of arm (MM) should position rocker (XX) so that lug (PP) will locate centrally in opening of lever (QQ). Adjust lever (QQ) rearward by means of its pivot screw (RR) or bend arm (NN) sidewise to suit.

Adjust latch (A2) by bending its lower lug (A4) so that the extension (NN) will cause (A2) to unlatch the yoke positioner arm (A1) on each bumper stroke of the cycle stopping arm (YY). When in neutral position, slight clearance should exist between (A2) and (NN) so that latch (A2) rests on yoke throwing arm (A1) when the latter is in plus or minus position.



Two methods of closing the switch blades (B9), Figure #5, are provided. With the clutch yoke (C) moved out of its neutral position, stud (A7) contacts the cam surface (A8) of switch closing arm (B1) moving its adjustable forward end (B8) upward and closing the contact points (C2). Switch closing arm (B1) is also moved upward by lever (B4) through the tension of spring (B6) as the clearing trip link (B3) moves forward. This forward movement of (B3) moves square stud (B5) out of the path of lever (B4) allowing its upward extension to contact adjustable stud (B2), thereby pivoting the switch closing arm (B1) upward and closing the contact points (C2). A third method of closing contact points (C2) is shown in Figure #38.

ADJUSTMENT

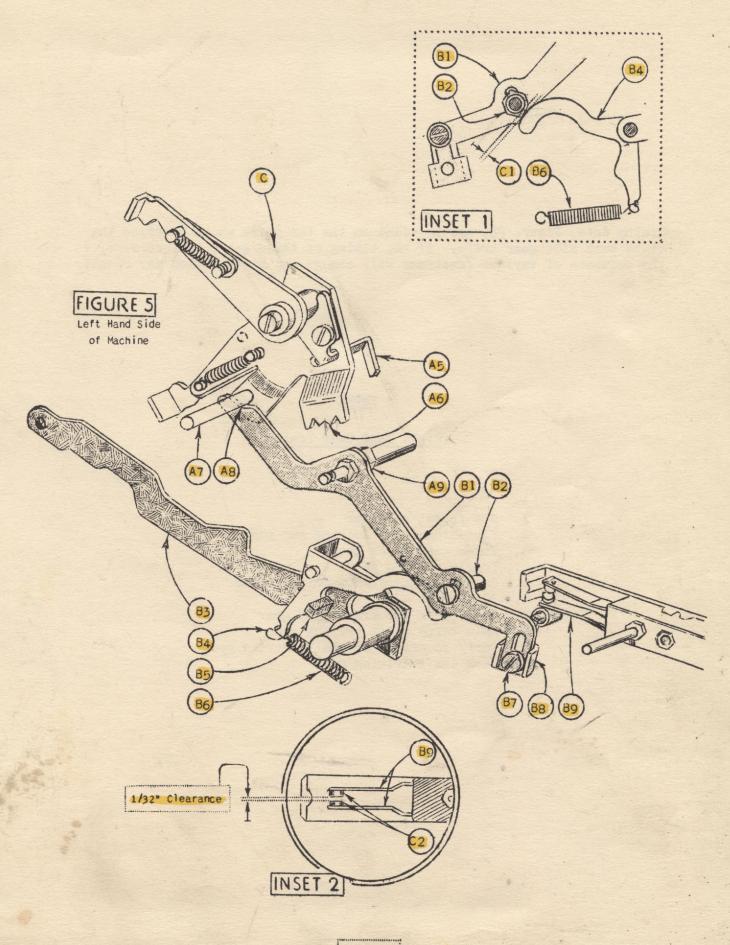
With the clutch yoke click adjusted to the neutral notch (A6) of the clutch yoke (C), adjust eccentric (A9) so that lowest point of cam surface recess (A8) engages the bottom of stud (A7).

Loosen screw (B7) and adjust (B8) upward or downward to secure 1/32" clearance between switch contacts (C2) when arm (B1) is in neutral, shown in Inset #2. It is absolutely necessary that the switch contacts (C2) are parallel and the blades (B9) exert only sufficient pressure to restore arm (B1) to neutral.

Adjust movable stud (B2) to obtain clearance of 1/32" at (C1) with machine in neutral, as shown in Inset $\frac{\pi}{1}$ 1.

With the trip link (B3) released, lever (B4) should safely close switch contact points (C2).

Adjust clutch yoke operating lever (A5) to obtain equal movement of the clutch yoke from the depression of either the plus or minus key.



Page 11

Timing dots, Figure #6, are provided on the ten gears which comprise the right hand side gear train. If the timing of these gears is incorrect, the sequence of various functions will change and misoperation may result.

INDEX

Right Hand Gear Train

- 1. Non-repeat cam gear
- 2. Plus-minus keys locking cam gear
- 3. Inner gear of #4 gear
- 4. Toggle setting gear
- 5. Selecting gear shaft driving gear
- 6. Idler gear
- 7. Idler gear for driving #9 gear
- 8. Main carry shaft driving gear
- 9. Carry counting cam shaft driving gear
- 10. Jack shaft driving gear

Depression of the shift keys while the machine is off-center is prevented by eccentric stud (D3), Figure #7, contacting extension (D4) of the carriage shift lever.

Depression of a shift key causes arm (D2) to pivot and raise pawl (C7). This will allow latch step (D5) to engage the off-set of lever (C5) and rock shaft (C4). When plunger (C3) contacts a depressed tabulator stop or the carriage limit stops, pawl (C7) is forced rearward thereby releasing shaft (C4) and stopping the shift.

Adjustable blank (C9) is provided to limit the toggle assembly (D1) and permit the locator cam (KK) to pass between the rollers (HE) without contacting them when the toggle (LL) is "made".

Lock (D8) prevents operation of the division and multiplication keys with the machine out of neutral position. With the locator toggle "made", adjustable stud (D3) on the locator toggle arm moves downward away from (D6) allowing the forward end of lock (D8) to move upward and block lock link (D7), thus preventing depression of the division and multiplication keys.

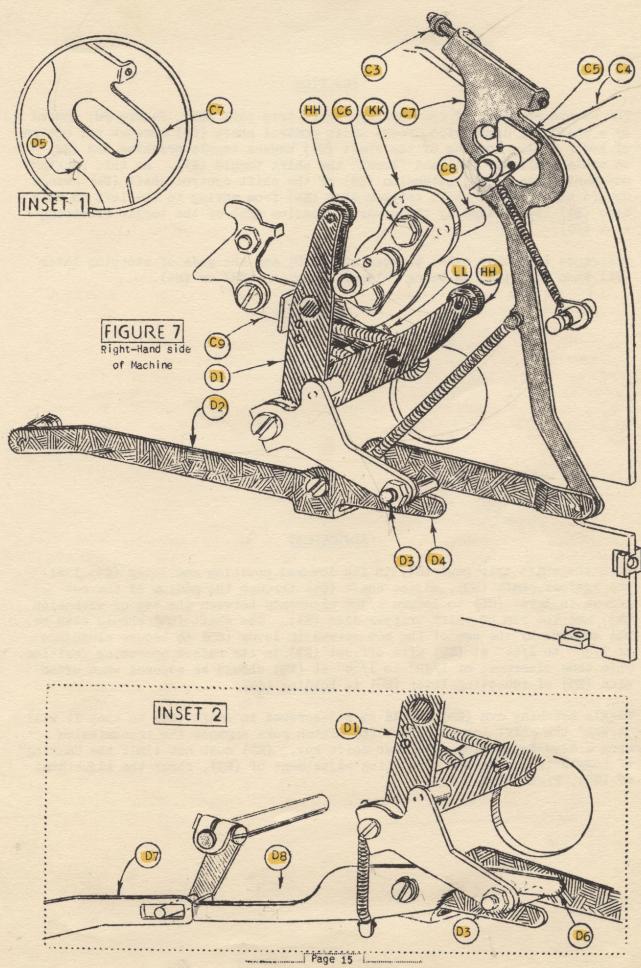
ADJUSTMENT

Adjust locator cam (KK) on the jack shaft through the medium of screws (C6) to locate the main carry shaft in such a manner that wedges #7,8,9 and 10 cannot be depressed when the machine is in neutral. With locator toggle (LL) "made", rotate shaft (C8) until cam (KK) is positioned lengthwise between rollers (HH). Limit plate (C9) should then be adjusted to position the locator so that equal clearance exists between the rollers (HH) and the extremes of cam (KK). The set-up adjustment should be checked after moving plate (C9), see Figure #25.

Arm (D2) should be adjusted upward or downward by bending to create slight latching clearance between step (D5) on pawl (C7) and off-set of lever (C5).

Adjust eccentric stud (D3) with the locator toggle fully "made" to contact extension (D4) without cramping.

Adjust lock (D8) to secure a full hold against slide link (D7) with the toggle fully "made". Adjust for clearance below slide link (D7) when the locator is in neutral.



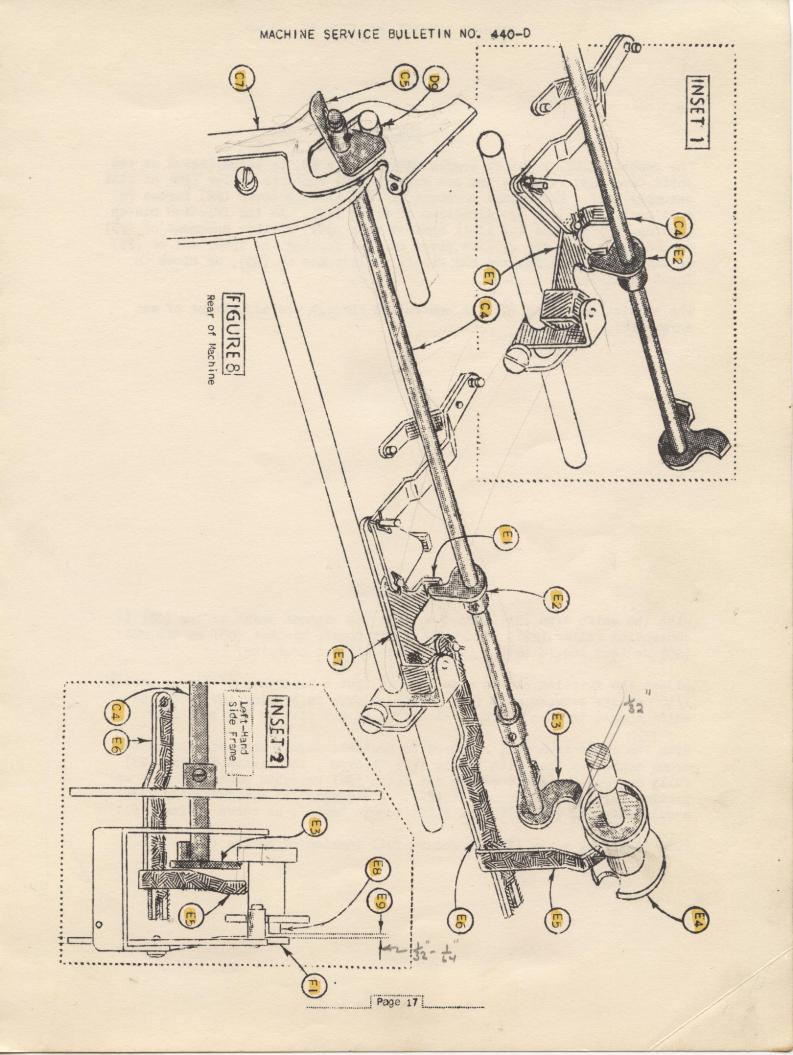
The upward movement of the carriage shift trip pawl (C7), Figure #8, caused by a shift key depression, rocks shift control shaft (C4) through the action of lever (C5). Rocking of the shaft (C4) causes toggle breaking arm (E2) to contact off-set (E1) and "break" the shift toggle (E7). As this rocking movement takes place, extension (E3) of the shift control shaft (C4) swings upward to block the shift tripper disc (E4) from moving to the left as this disc (E4) is released by the upward extension (E5) of the toggle resetting link (E6).

Clearance (E9) must exist between stud (E8) and the side of stopping latch (F1) when disc (E4) is being held by extension (E3) or (E5).

ADJUSTMENT

With the shift trip pawl (C7) in its lowered position and lever (C5) limited against shaft (D9), adjust shaft (C4) through the medium of the set screws in lever (C5) to secure 1/32" clearance between the top of extension (E3) and the rim of shift tripper disc (E4). The shaft (C4) should also be set endwise by the use of the set screws in lever (C5) to secure clearance of 1/32" to 1/64" at (E9) with off-set (E3) in its raised operating position. This same clearance of 1/32" to 1/64" at (E9) should be secured when extension (E5) of resetting lever (E6) is holding (E4)

Toggle breaking arm (E2) should be set-screwed to shaft (C4) so that it will "break" the shift toggle before the clutch yoke engages the transmission upon a slow depression of either shift key. (E2) must not limit the "making" of toggle (E7). Before attempting adjustment of (E5), check the adjustment of (G5), Figure #9.



The resetting of the shift toggle (E7), Figure #9, is accomplished as the shift drum (G3) revolves and cam surface (G2) contacts roller (F9) of link assembly (G1). The upward movement of (G1) through lever (F8) forces resetting link (E6) in the direction of arrow (F7). As the friction clutch housing (G7) reaches its limit against nuts (G8), further movement of (E6) causes the roller arm (F5) to pivot at (F4) forcing the inner end of (F5) to move blank (F6) outward and create a clearance at (G9), as shown in Inset #1.

The tension on spring (H1) is controlled through the adjustment of set screw (F2).

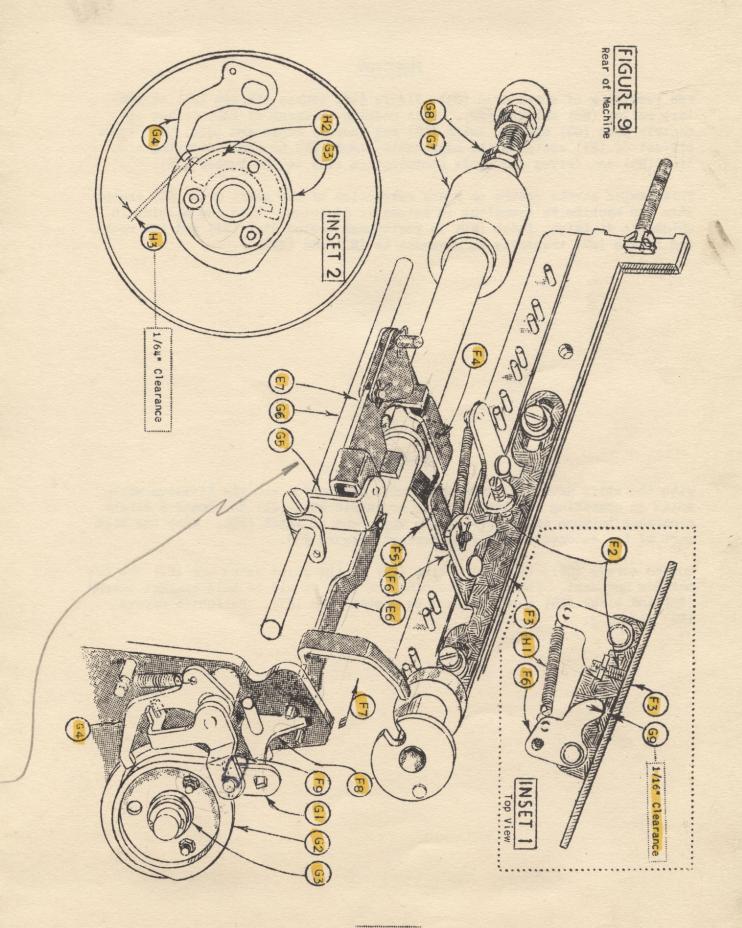
ADJUSTMENT

With the shift drum (G3) turned so that the highest point of cam (G2) is contacting roller (F9), adjust the shift toggle bracket (G5) on tie rod (G6) so that toggle (E7) is fully "made" without cramping.

Adjust the friction clutch nuts (G8) so that a clearance of approximately 1/16" exists between nuts (G8) and the sleeve in housing (G7) with the shift toggle "broken". There should be no end play in the jack shaft.

With the shift drum (G3) restored to neutral, adjust bracket (F3) on the cross member so that with toggle (E7) "broken", the clutch housing (G7) fully engages the shift clutch and latch (G4) releases pawl (H2) with approximately 1/64" clearance at (H3). A clearance of approximately 1/16" should exist at (G9) with the shift toggle "made"; as shown in Inset #1.

Turn adjusting screw (F2) to secure full tension of spring (H1).



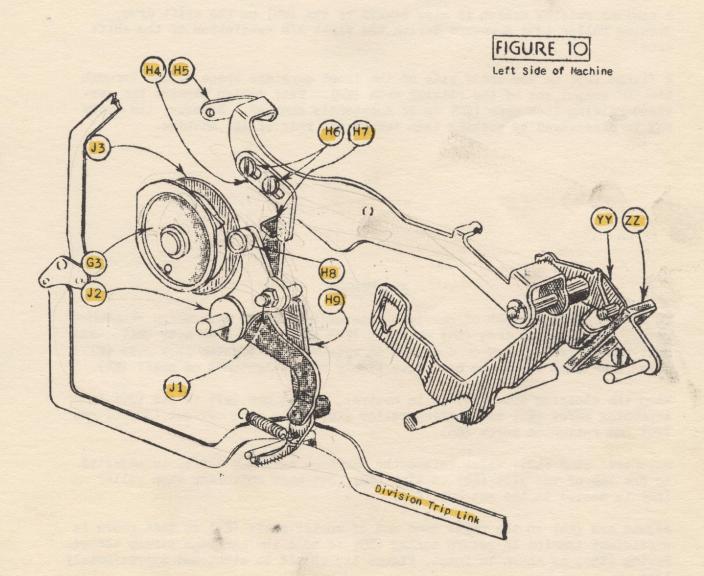
The revolving of shift drum (G3), Figure #10, causes its cam (J3) to contact roller (H8) and arm (J2). This rocking movement of (J2) drives eccentric stud (J1) against latch (H9) and thereby rocks arm (H7). The upper off-set of (H7) contacts the adjustable blank (H4) on cycle stopping arm link (H5) and drives the cycle stopping arm (YY) to the bumper (ZZ).

This bumper stroke occurs on every revolution of the shift drum (G3) except when the machine is operating in automatic division. With the machine in automatic division, latch (H9) is positioned behind stud (J1) and the rocking of arm (J2) transmits no movement to (H7) and (YY).

ADJUSTMENT

With the shift drum (G3) turned 1/8 of a revolution and the division mechanism in operating position, adjust eccentric stud (J1) to create a slight clearance between stud (J1) and the upper end of latch (H9). Keep the high part of the eccentric stud (J1) forward, Figure #37.

Loosen screws (H6), turn shift drum (G3) to the point where arm (H7) has its maximum movement. The cycle stopping arm (YY) should be held against bumper (ZZ) and blank (H4) held rearward to contact arm (H7). Retighten screws (H6) securely.



Page 21

The raising of the carriage and also its seating is achieved by means of two arms, one which is shown here as (K2), Figure #11. These arms pivot upward and downward from the motion of links (K3) attached to rocker shaft arms (K5).

Whenever the clear drum (J7) revolves, roller (K8) on raising arm (K7) is forced downward by action of cam (J6) causing shaft (K4) to rock. The carriage is moved upward, by action of raising arms (K2), to permit clearing of the registering dials.

A similar raising action is also caused by cam (J4) on the shift drum, forcing roller (J5) downward during the first 1/8 revolution of the shift drum.

A flange (J9) on the under side of the front carriage brace slides through the "U" shaped end of the raising arms (K2). This design permits the carriage raising-lock arms (K2) to be constantly engaged. However, the locks may be disengaged by pushing them toward the rear of the machine.

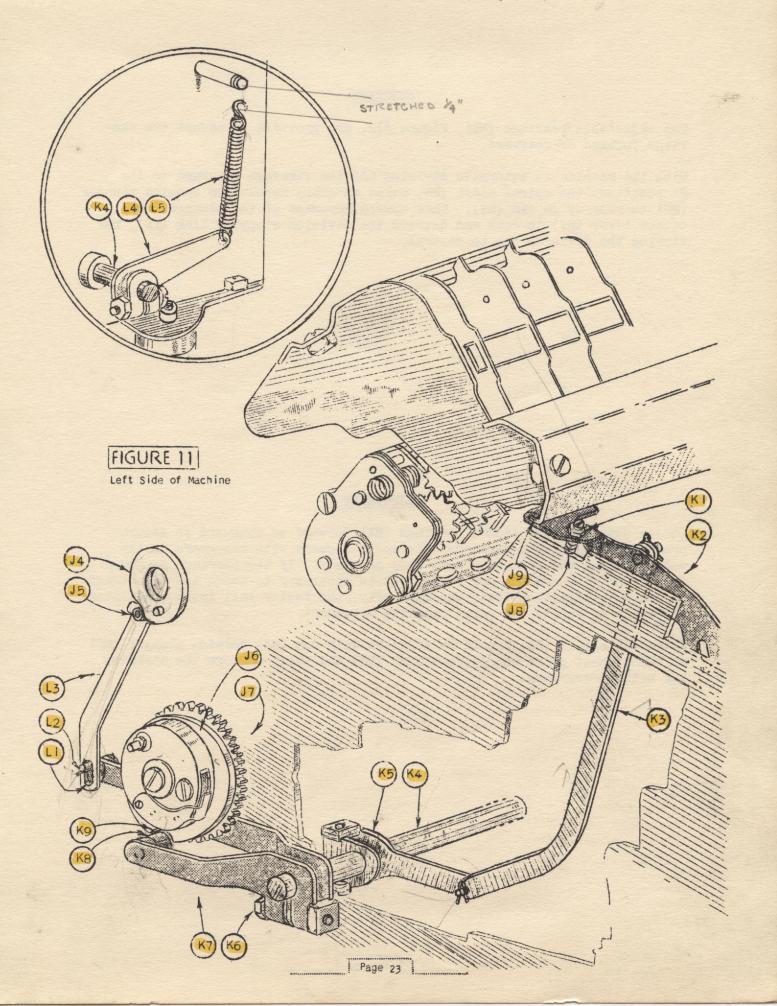
ADJUSTMENT

To adjust depth of mesh of carriage intermediate gears with wedge section gears, loosen clamp arms (K5) on shaft (K4) and loosen lock nuts (K1). Adjust screws (J8) upward or downward as required and tighten lock nuts (K1). Clamp arms (K5) should be held down firmly and retightened on shaft (K4).

When the clearing drum (J7) is in neutral, adjust arm (K7) to cam (J6) by loosening screw (K6) and seating roller (K8) fully into cut-out (K9) of cam (J6) and retighten screw (K6).

Eccentric stud (L2), which raises the carriage during a shift, is adjusted to the top of the slot (L1) in link (L3), but must not cramp when roller (K8) is seated in the cut-out (K9).

Adjust arm (L4) on the right hand end of rocker shaft (K^4) so that there is sufficient tension on return spring (L5) to hold the carriage firmly seated. Spring (L5), as shown in Inset, Figure 11, should be stretched approximately 1/4".



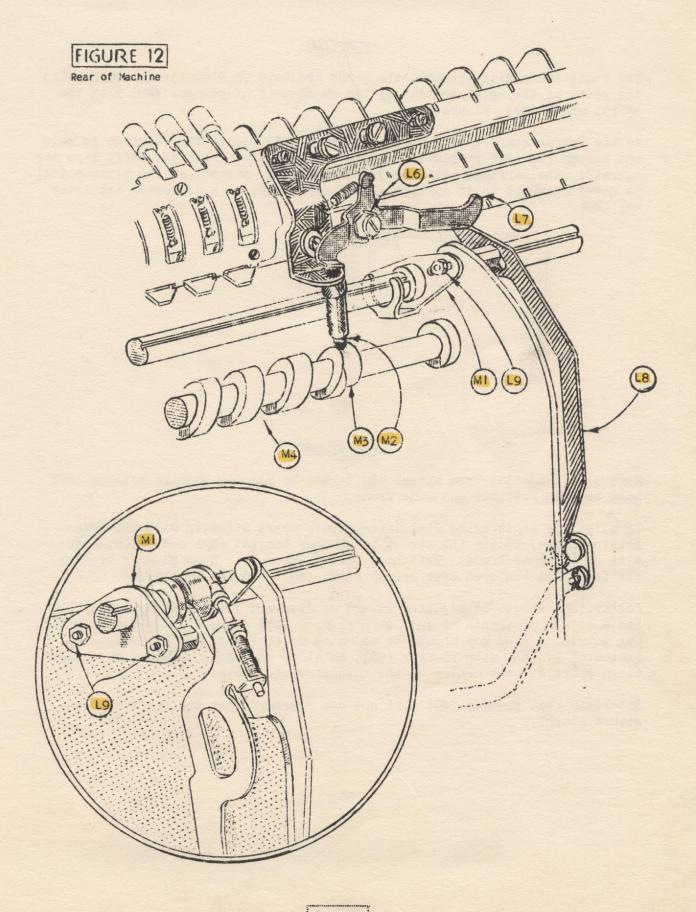
Two adjustable bearings (M1), Figure #12, are provided to adjust the carriage forward or rearward.

With the machine in automatic division and the carriage returned to its #1 position, the spiral shaft (M4) makes an extra revolution causing plunger (M2) to ride up on cam (M3). This upward movement of the plunger (M2) causes lever (L7) to rock and depress the division stopping link (L8), restoring the division key to neutral.

ADJUSTMENT

Loosen nuts (L9) and adjust bearings (M1) forward or rearward to secure proper meshing of the carriage intermediate gears with the gears of the wedge section and retighten nuts (L9) securely. If the carriage is moved forward or rearward for any reason, it is necessary to check the adjustments of the multiplication trip, the butterfly, the feeler bail latch, tabulator releasing of shift, and carry counting alignment.

Eccentric sleeve (L6) should be adjusted with cam (M3) holding plunger (M2) at its highest point, to depress link (L8) and fully restore the division key without cramping.



The registering dial intermediate gears are held in sidewise alignment with the gears of the wedge section by the engagement of plunger (M2) with the spiral shaft (M4), Figure #13.

As the spiral shaft (M4) revolves, plunger (M2) causes the carriage to move one column for each revolution of the spiral shaft. When the shift keys are operated, the carriage shifting is automatically stopped as the plunger (C3) is moved rearward as it contacts limit stops (M6) or a depressed tabulator key (M9).

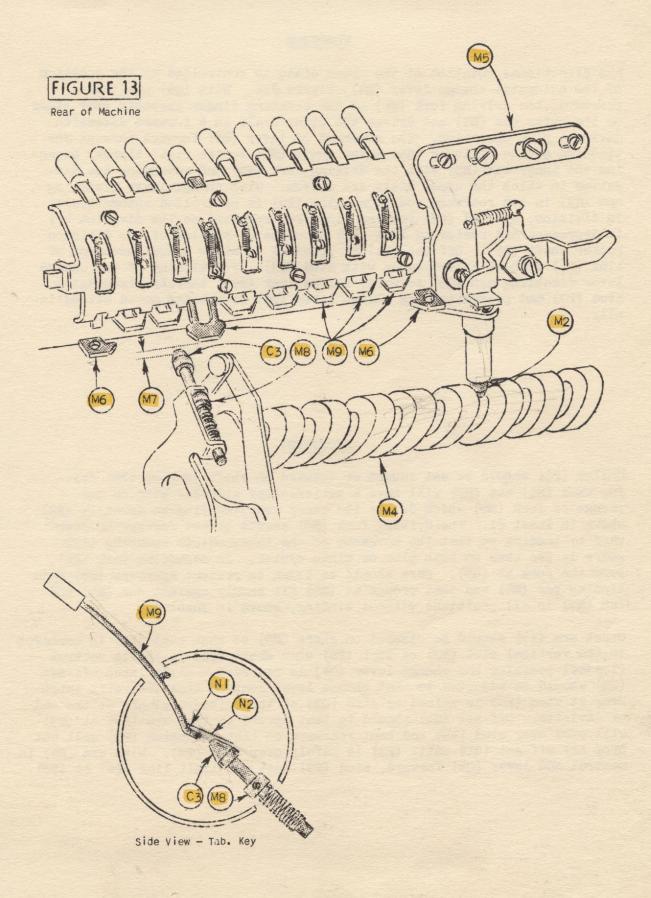
ADJUSTMENT

Remove all end play from spiral shaft (M4) by placing washers between left hand bearing retainer and side frame.

To align the registering dial intermediate gears sidewise with the wedge section gears, loosen the screws in plunger bracket (M5) and adjust sidewise on the rear brace. Retighten screws securely. Keep plunger bracket vertical, and centered over spiral shaft (M4). Adjust by bending.

Collar (M8) should be adjusted upward or downward so that plunger (C3) has a slight clearance at (M7) when plunger (C3) is in its lowered position. The tabulator stop key should be adjusted so that surface (N1) aligns as indicated by (N2) with plunger (C3), as shown in Inset. Plunger must also align sidewise with center of the tabulator stop keys.

Ascertain that plunger (C3) will not cam rearward when the shift key is struck sharply.

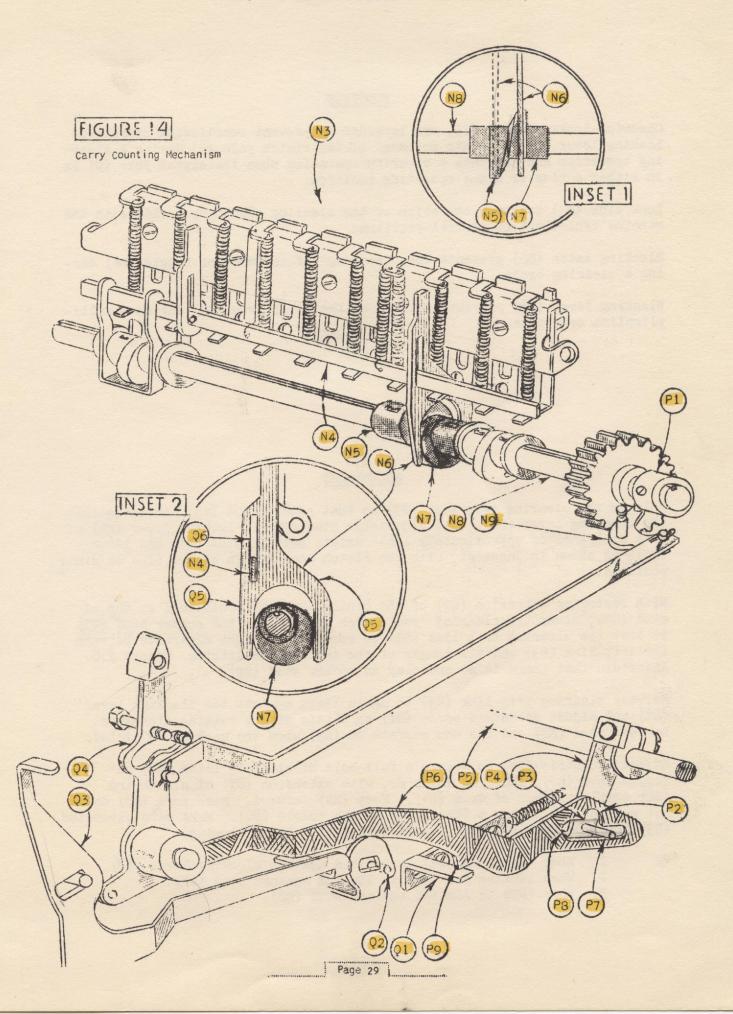


The directional rotation of the upper dials is controlled by the position of the automatic change lever (Q4), Figure #14. With (Q4) positioned rearward, the driving fork (N6) of the counting finger assembly (N3) rides on the outer cam (N7) and drives the upper dials in a forward direction during a plus operation. The movement of lever (Q4) forward through the pivoting action of lever (N9) moves shaft (N8) to the right thereby engaging the inner cam (N5) with the driving fork (N6) and reversing the direction in which the upper dials are driven. With change lever disabling arm (Q3) in its rearward position, link (P6) is controlled automatically in division, by stud (P7) pulling link (P6) rearward as the division key is depressed and restoring link (P6) upon the re-setting of the division rocker shaft (P5). Off-set (Q1) is provided to allow manual movement of link (P6) without interference with stud (P7). Positioning of the change lever disabling arm (Q3) forward, raises link (P6), thereby disengaging stud (P7) and preventing the change lever (Q4) from being moved automatically.

ADJUSTMENT

Collar (P1) should be set inward or outward on shaft (N8) so that driving cams (N5) and (N7) will have a satisfactory sidewise hold on the prongs of fork (N6) which drives the carry counting fingers assembly (N3), shown in Inset #1. The driving fork (N6) should be set forward or rearward by bending so that the movement of the intermediate counting dial gears is the same on both plus or minus cycles. In adjusting fork (N6), bend the fork at (Q5). Care should be taken to prevent aperture (Q6) from binding bar (N4) and that prongs at (N6) fit snugly against cam (N5) and cam (N7) in all positions without binding, shown in Inset #2.

Crank arm (P4) should be clamped on shaft (P5) so that stud (P7) is centered in the vertical slot (P2) of link (P6) when shaft (P5) is in its neutral (loaded) position and change lever (Q4) is rearward. Slide latch off-set (Q1) should be adjusted so that change lever control link (P6) will latch over it when (P6) is raised by stud (Q2) as the keyboard clears at the end of division. Off-set (Q1) should be bent upward so that arm (P6) at (P3) will pass over stud (P7) and bent rearward so that extension (P9) will not drop off off-set (Q1) until (P3) is safely over stud (P7). With arm (P4) in neutral and lever (Q4) forward, stud (P7) must not limit link (P6) at (P8).



Clearing locks, Figure #15, are provided to prevent conflicting operations. Locking lever (R1) prevents movement of the clutch yoke (C) during a clearing operation and prevents a clearing operation when the clutch yoke (C) is in either a plus or minus operating position.

Lock link (R3) prevents operation of the clearing clutch drum (S4) with the machine cycled out of neutral position.

Blocking latch (R5) prevents the "breaking" of the machine toggle (R6) during a clearing cycle.

Blocking lever (R8) prevents release of the clear drum (S4) during a multiplication operation.

ADJUSTMENT

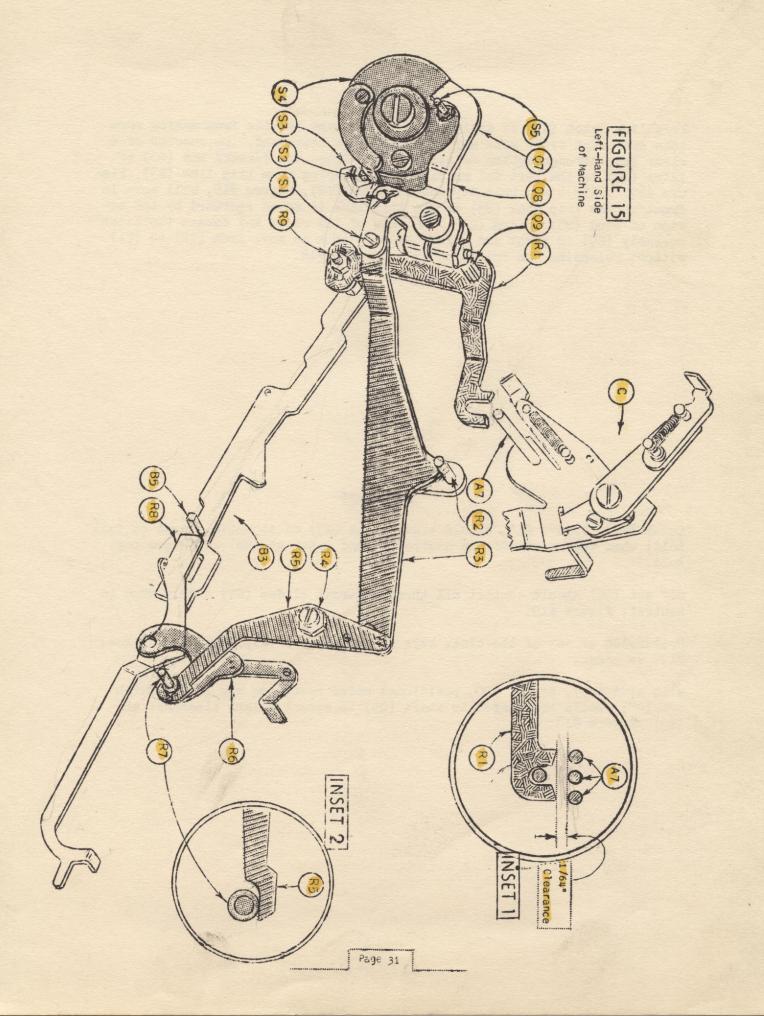
Release the clearing trip link (B3) so that square stud (B5) limits against the blocking lever (R8). Set adjustable stud (R9) in locking lever (R1) so that clearance of approximately 1/64" exists between stud (A7) and lever (R1), as shown in Inset #1, with the clutch yoke (C) in either plus or minus position.

With restoring extension (Q7) of the clutch arm (Q8) positioned on top of stud (S5), clamp the clearing drum clutch arm (Q8) to the rocker stud (Q9) so that the clearing trip link (B3) is reset with slight clearance between the trip link (B3) and the longer of the two release latches, Figure #18. Ascertain that there is no end play in rocker stud (Q9).

Release clearing trip link (B3) to again limit against the blocking lever (R8) and adjust eccentric screw (S1) to obtain slight rubbing clearance between stud (R2) and the cam surface on (R3) when the machine is cycled.

Adjust eccentric (R4) to secure a full hold of blocking latch (R5) on toggle stud (R7), shown in Inset #2, with extension (S3) of clutch arm (Q8) completely out of drum (S4). Keep (R4) forward. Make sure (R5) does not rub on (R7) during a "breaking" of the toggle (R6). Make sure extension (S3) engages pawl (S2) with a safe hold during the following:

- 1. When trip link (B3) is limited against blocking lever (R8).
- 2. When locking arm (R1) is limited against stud (A7).
- 3. When (R3) is limited against stud (R2).



Trip link latch (S9) is designed to prevent the machine from making more than one clear cycle with any clear key held depressed. Depression of a clear key, through action of slides (S7), moves the forward end (S6) of latch (S9) to the left and releases the clearing drum trip link (B3), Figure #17. With a key held depressed, latch (T2), Figure #18, will move in front of the trip link (B3) as the trip link is moved rearward by the action of stud (S5) on arm (Q7). Release of the clear key causes the latch assembly (S9) to pivot and allow the trip link to move from (T2) to (T1) without releasing the trip link (B3), Figure #16.

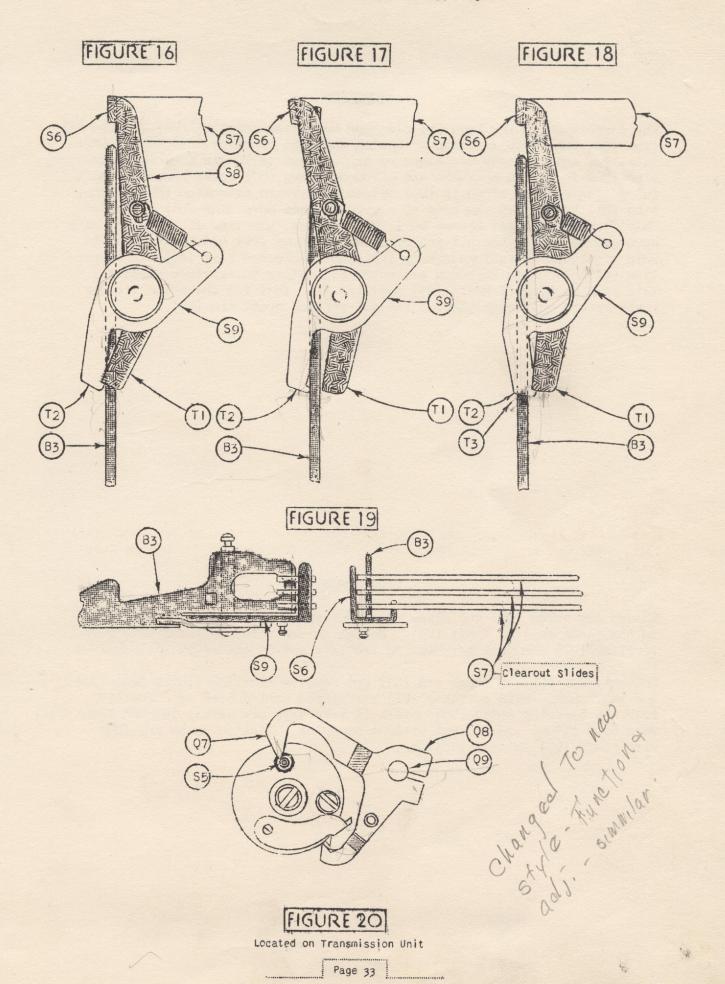
ADJUSTMENT

Latch (T1), Figure #16, should engage link (B3) as shown(in excess of full hold) when the machine is in neutral. Bend latch at (S8) to secure this hold.

Off-set (S6) should contact all three clearout slides (S7) evenly when in neutral, Figure #19.

Depression of any of the clear keys should release trip link (B3), Figure #17, as shown.

With stud (S5), Figure #20, positioned under restoring arm (Q7), clutch arm (Q8) should be clamped to shaft (Q9) to secure slight clearance at (T3), Figure #18.

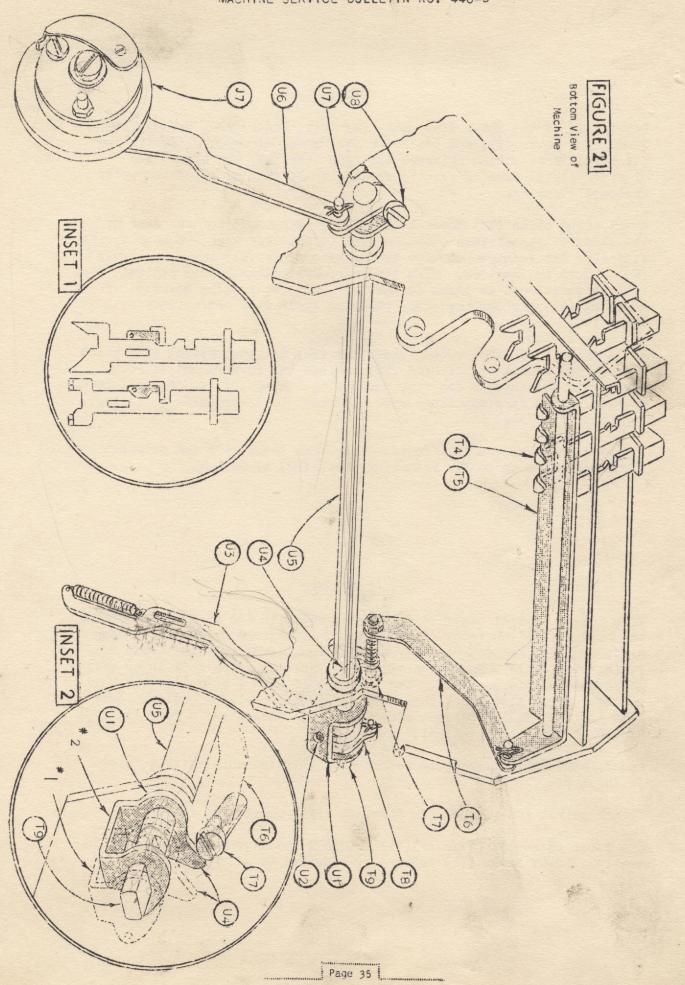


The depression of the keyboard clearing key moves coupling (U1), Figure #21, from position #1 to position #2 behind the head of screw (T7), shown in Inset #2, and releases the clearing clutch drum (J7). As drum (J7) revolves, link (U6) is pulled rearward and through an arm (U7) rocks clearing shaft (U5). The rocking of shaft (U5) causes the upward extension (U4) of coupling (U1) to contact the head of screw (T7) and move link (T6) forward. This forward movement causes bail (T5) to rock, pivoting its rearward edge downward to engage the off-set of zero key stems (T4) and resets them to zero position, thereby releasing any other depressed keys in their respective columns. This keyboard mechanism is similar to previous models. This same rocking of shaft (U5) operates link (U3) for the automatic carriage return mechanism through the set-screwed crank arm (T8).

ADJUSTMENT

Loosen set screw (U2) and slide the crank arm (T8) to its left hand limit on the flats (T9) of shaft (U5). Retighten set screw (U2) and make sure coupling (U1) has full movement to the left and to the right.

Loosen screw (U8) on crank arm (U7) and revolve clearing clutch drum (J7) one half turn. With coupling (U1) positioned behind head of screw (T7), rock the clearing shaft (U5) until all zero keys are safely latched downward with slight excess, but without cramping. Tighten crank arm (U7) with shaft (U5) in this position.



Depression of the lower dial clear key (U9), Figure #22, through its connecting lever (V1) and its lever (V2) moves clearout slide (V3) to the left. This action releases the trip link (B3) and allows the clearing clutch drum to revolve rocking shaft (U5) as described under keyboard clearing.

As clearing slide (V3) moves to the left, prongs (V5) on the rear of the slide (V3) positions coupling (V6) to the left also, thereby moving stud (V8) into engagement with both ends of fork (W1) on rocker lever (V9), shown in Inset #2. With the lower dial clear key in neutral, stud (V8) is positioned as shown in Inset #1, so that rocking movement of coupling (V6) through any other clearing cycle will not actuate rock lever (V9).

As clearing shaft (U5) rocks, clamp arm (V4) drives coupling (V6) which through the medium of its stud (V8), raises the forward end of rock lever (V9) and through its rear connecting linkage, turns the left hand section of the carriage hinge rod, clearing the lower dials as in previous models. Inset #3.

Lug (V7) on clamp arm (V4) restores the rock lever (V9) and attached clearing mechanism on the return of shaft (U5) to neutral.

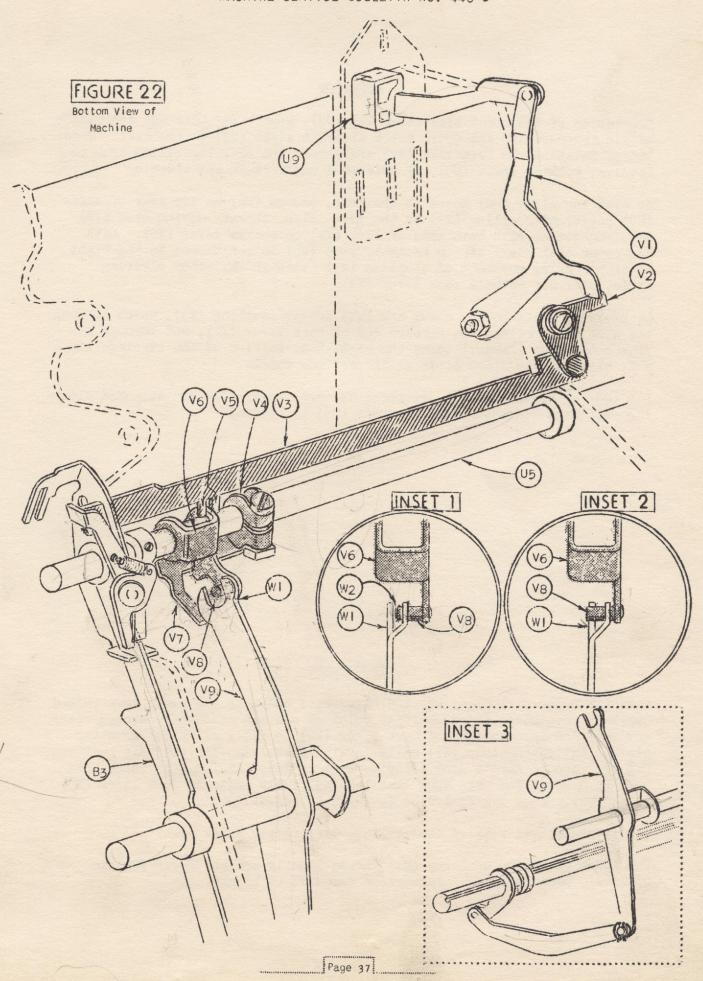
ADJUSTMENT

With the lower dial clear key depressed and with the clear drum turned one half revolution (rock shaft at point of maximum movement), loosen clamp arm (V4) and depress rear of rock lever (V9) to fully clear out registering dials. Retighten clamp (V4) while holding rock lever (V9) depressed in this position. Lug (V7) should have a good sidewise hold on lever (V9); also check this hold in neutral position and make sure that lug (V7) fully restores rock lever (V9) to neutral. Bend lug (V7) upward or downward to adjust.

Adjust stud (V8) sidewise to secure a slight clearance at (W2), shown in Inset #1.

Do not permit end play of the carriage lift rocker arms (V9).

The lower extension of lever (V1) should lightly contact lever (V2) in neutral. Bend lever (V1) forward or rearward to adjust.



Depression of the upper dial clear key (W3), Figure #23, through the medium of its levers (W4) and (W5), moves clearout slide (W8) to the left. This action releases the trip link (B3) and allows the clearing clutch drum to revolve, rocking shaft (U5), as described under "keyboard clearing".

As clearing slide (W8) moves to the left, prongs (W6) on the rear of slide (W8) positions coupling (X3) to the left also, thereby moving stud (V8) into engagement with both ends of fork (X1) on rocker lever (X2). With the upper dial clear key in neutral, stud (V8) is positioned to the right so that rocking movement of coupling (X3) through any other clearing cycle, will not actuate rock lever (X2).

As clearing shaft rocks, clamp arm (W7) drives coupling (X3), which through its stud (V8) raises the forward end of rock lever (X2), and through its rear connecting linkage, turns the right-hand section of the carriage hinge rod, clearing the upper dials as in previous models.

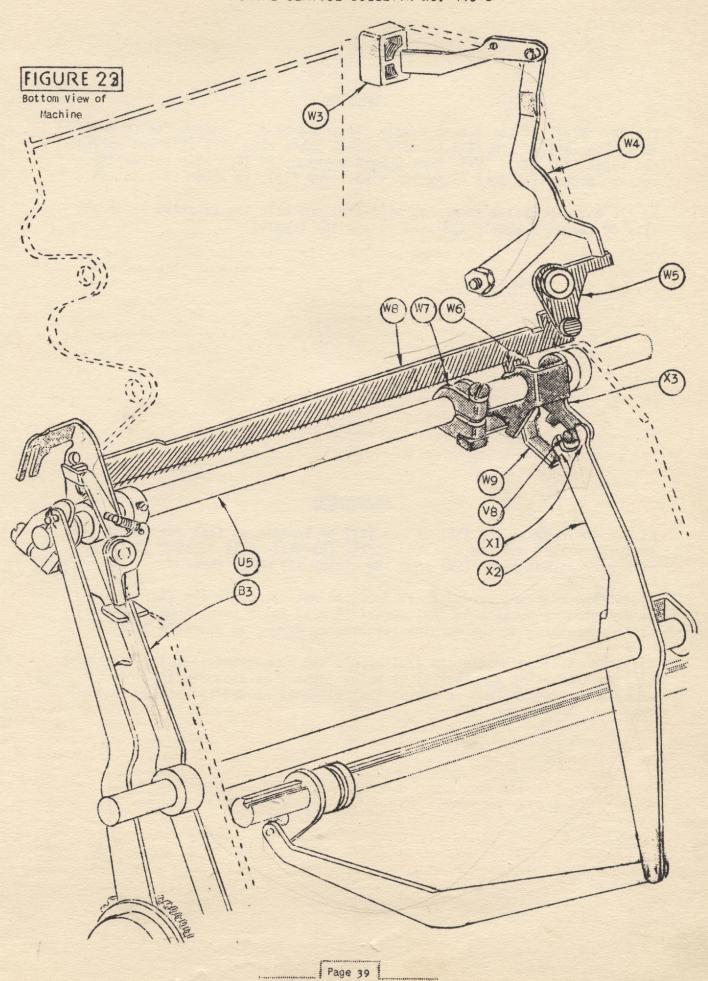
Lug (W9) on clamp arm (W7), restores the rock lever (X2) and attached clearing mechanism on the return of shaft (U5) to neutral.

ADJUSTMENT

With the upper dial clear key (W3) depressed and with the clear drum turned one-half revolution (rock shaft at point of maximum movement), loosen clamp arm (W7) and depress rear of rock lever (X2) to fully clear out counting dials. Retighten clamp (W7) while holding rock lever (X2) in this position. Lug (W9) should have a good sidewise hold on lever (X2). Also check this hold in neutral and make sure that lug (W9) fully restores rock lever (X2) to neutral. Bend lug upward or downward to adjust.

Do not permit end play of the carriage lift rocker arms.

The lower extension of lever (W4) should lightly contact lever (W5) in neutral. Bend lever (W4) forward or rearward to adjust.



The "breaking" of the set-up toggle (X8), Figure #24, causes the forward extension (X6) of arm (X7) to move upward contacting stud (X5) and raises the repeat key (X4). This same upward movement of (X6) also raises the release kicker (P) into alignment with lever (Y3), as shown in Inset #3.

As the machine cycles in minus, stud (Y2) contacts the rearward extension (Y1) of toggle assembly (X8) and resets the toggle.

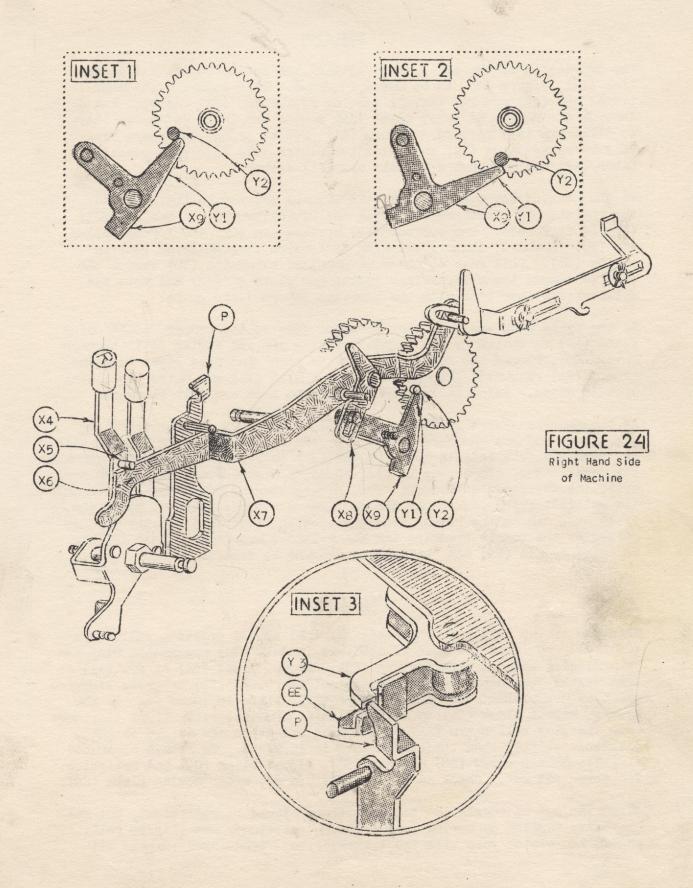
ADJUSTMENT

Adjust the forward end (X6) of arm (X7) by bending so that the repeat key is fully raised and the clearing kicker (P) will contact lever (Y3) and will not contact lever (EE) when the kicker (P) moves forward.

Adjust the rearward extension (Y1) of the set-up toggle arm (X9) upward or downward by bending so that stud (Y2) will fully reset toggle (X8) without cramping as the machine revolves in minus, as shown in Inset #2.

Extension (Y1) on toggle arm (X9) should not come point-to-point with stud (Y2) as the set-up toggle (X8) is being "made", as shown in Inset #1. Elongate extension (Y1) or adjust (X6) slightly upward by bending to correct this condition.

__ Page 40 i_____



The depression of the set-up key "breaks" the set-up toggle and causes link (Y6), Figure #25, to be moved downward. This downward movement pivots cam (Z4) upward, thereby forcing roller arm (Z3) rearward and through the medium of pivot point (Z9) causes the lower extension (lA) to pivot arm (Al) forward. As arm (Al) pivots, prong (5A) moves rearward to engage stud (Y4) and moves the clutch yoke into plus position. Latch (A2) moves downward to hold arm (A1) forward.

As the machine revolves in plus with figures entered on the keyboard, the registering dials are displaced and extension (Y8) of cam assembly (Z1) is depressed. Cam surface (Y7) strikes arm (ZA) and forces roller arm (Z3) rearward, thereby building up tension through lever (Z6) on spring (Z5). This same downward movement of extension (Y8) causes cam (Z1) to engage the sub-carriage positioner plate at (Z2) and move the sub-carriage into mesh with the carriage intermediate gears.

As the cycle stop arm on a plus movement goes to the bumper, positioning latch (A2) is raised by the toggle breaking arm, and spring (Z5) through lever (Z6), forces the roller arm (Z3) to pivot and move right hand end of arm (A1) rearward. Prong (4A) engages stud (Y4) and moves the clutch yoke in minus. Latch (A2) moves downward to hold arm (A1) rearward.

As the machine cycles in minus, cam (Y9), Figure #25, on the selecting gear shaft engages cam surface (Z2) to hold the sub-carriage in mesh with the carriage intermediate gears as cam (Z1) is restored to neutral through the resetting of the set-up toggle, shown in Figure #24. During a minus cycle the figure is subtracted from the registering dials and entered into the multiplication dials. As the machine on a minus movement moves the cycle stop arm to the bumper, the positioning latch (A2), Figure #25, is raised by the toggle breaking arm and releases arm (A1). Plate (Z2) is released by cam (Y9) and the machine returns to neutral.

ADJUSTMENT

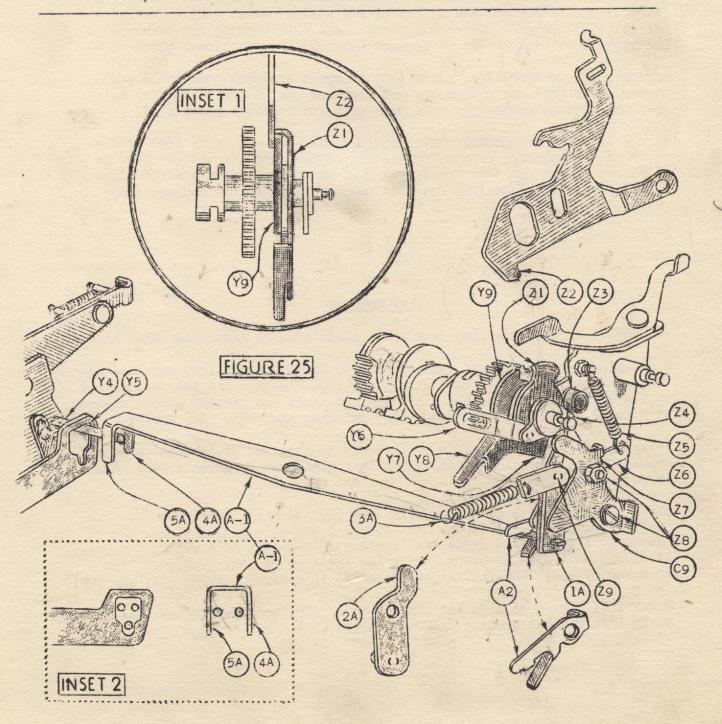
When the set-up toggle is "broken", cam (Z4) should position roller arm (Z3) fully rearward and move clutch yoke in full plus engagement with the transmission without cramping arm (Z3). Adjust prong (5A) of arm (A1) so that clutch yoke stud (Y4) limits against rear wall (Y5) of cycle stopping arm aperture without cramping in latch (A2), shown in Inset #2. If necessary, adjust blank (C9) so that it limits arm (Z6) with slight clearance from the plus roller arm (Z3) on the plus operation and allows slight clearance at (Z7) when the clutch yoke is in minus. To obtain clearance at (Z7), loosen screw (Z8) and nut (Z8), adjust blank (C9) and retighten the screw and nut. Check adjustment, Figure #7, after moving plate (C9).

After the set-up toggle is "broken", there should be sufficient, but not excessive tension on spring (3A) to cause positioner arm (1A) to fully engage the clutch yoke with the transmission. (Continued on page 43)

ADJUSTMENT

Springs (3A) and (Z5) should be of sufficient tension to definitely move the clutch yoke and not have excessive tension. The tension on these springs should not be changed by cutting. Adjust prong (4A) so that stud (Y4) limits against forward wall of the cycle stop arm without cramping, shown in Inset #2.

The inner edge of cam (Z1), which moves plate (Z2), should be flush with the inner edge of cam (Y9) on the selector shaft which holds plate (Z2) to the left, see Inset #1:



With the carriage and the transfer slide out of their #1 positions, the sub-carriage (6A), Figure #26, may be moved by lever (7A). Lever (7A) pivots as it moves to the left, releasing latch (9A) from sub-carriage positioner plate (Z2) and allowing the sub-carriage to be displaced. As the carriage is returned to its #1 position, the adjusting screw (5B) strikes the rear off-set (9B) of the slotted positioner lever (8B). This lever is positioned outward by and pivots against slide (1C). Forward off-set (7B) contacts sub-carriage end plate (3B) forcing sub-carriage to the right until latch (9A) re-engages sub-carriage positioner plate (Z2).

During a set-up operation, slide (1C) is moved rearward to disable positioner lever (8B) and allows the sub-carriage positioner plate (Z2) to move the storage gears (2B) into mesh with intermediate gears (1B).

When a transfer is accomplished through a C.P. set-up, lever (8B) is disabled as the carriage returns to its #1 position and the sub-carriage is relatched by off-set (3B) contacting (7B) which is limited against screw head (6B), and as plate (Z2) moves to the left during the set-up, (9A) relatches.

ADJUSTMENT

Remove all excess side play from shift plate (Z2) by inserting shims at (4B).

Bend extension (3B) inward sufficiently to limit against (7B) and allow latch (9A) to reset over plate (Z2) with lever (8B) disabled and the machine cycled in a set-up. Ascertain that (3B) does not limit and prevent proper meshing of storage gears (2B) with gears (1B) or cramp the plate (Z2) during a set-up.

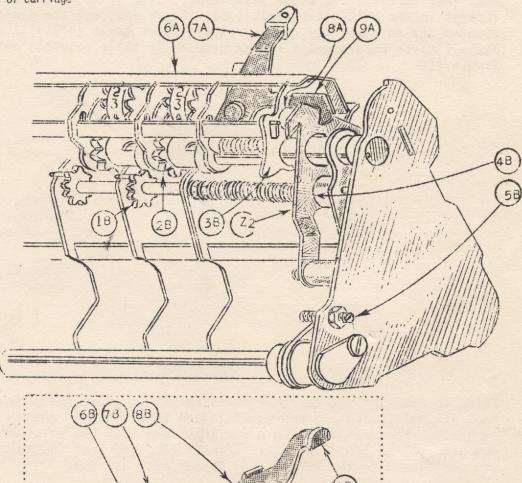
Sub-carriage positioner plate (Z2) should be adjusted by bending to hold storage gears (2B) disengaged with slight clearance from gears (lB) when machine is in neutral.

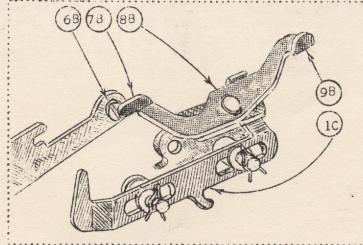
Plate (Z2) must also hold gears (1B) and (2B) safely in mesh when the subcarriage is positioned to the left during a set-up. A shim washer may be placed at (8A) to move gears (2B) further to the left on a set-up. Caution: After installing shim washer, check the latching of (9A) over (Z2), the cramping of (3B), and for slight clearance in neutral between (1B) and (2B).

Screw (5B) should be adjusted against lever (8B) to safely latch (9A) over plate (Z2) without binding disabling slide (1C).

FIGURE 26

Bottom View of Carriage



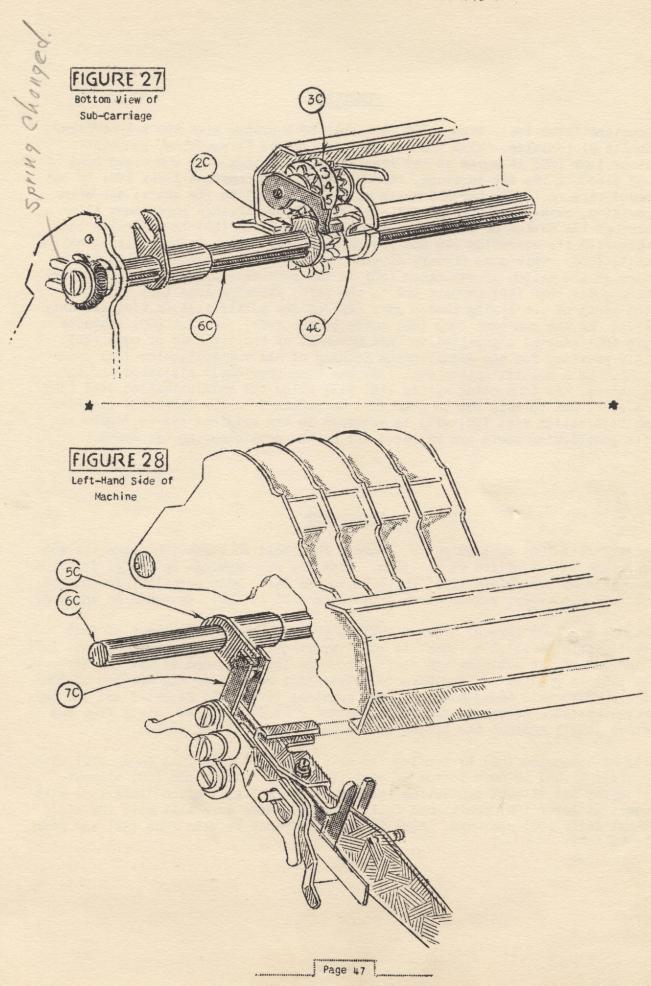


Right Hand Side of Machine

When the carriage is raised during a clearing operation, the multiplication lift cam arm (5C), Figure #28, rocks the sub-carriage shaft (6C) through its engagement with the stud in bracket (7C). This rocking of shaft (6C) causes cams (2C) to raise the check pawls (4C). If a constant has previously been entered in the multiplier dials (3C), Figure #27, and the dials have been counted out to zero, the raising of the check pawls (4C) will allow the dials (3C) to return under spring tension to their original set-up position, Figure #29.

ADJUSTMENT

Prior to removing the carriage or reinstalling it on the machine, ascertain that all multiplication set-up dials and their storage gears are cleared to neutral. When reinstalling a carriage, see that the multiplication lift cam arm (5C) is properly set in bracket (7C) and that the feeler fingers are positioned to the rear of the feeler bail and cam.



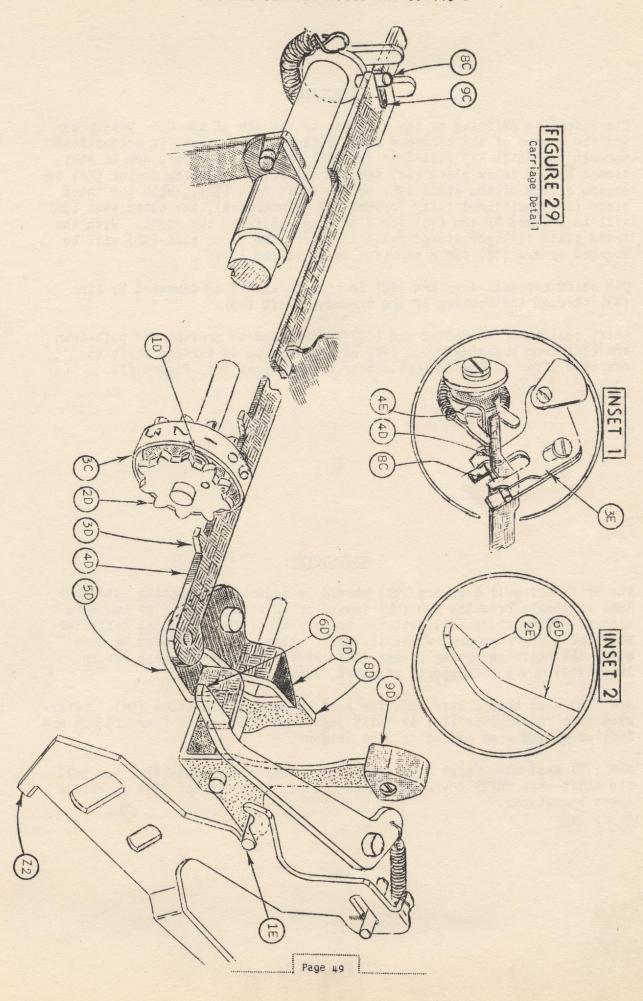
Constant lever (9D), Figure #29, can only be operated with the sub-carriage in its #1 position. With the sub-carriage in its #1 position, constant lever lock (6D) is moved to the right through contact with the right hand end plate of the sub-carriage, thereby permitting constant lever (9D) to be moved forward. This forward movement of lever (9D) to its active operating position, raises the forward end (Z2) of the sub-carriage positioner plate through the action of pin (IE). This disables plate (Z2) from further contact with its operating cam and prevents further set-up in the multiplication dials (3C). This same forward movement of (9D) causes blank (5D) to pivot through the action of extension (8D) on cam surface (7D). This pivoting action moves comb (4D) forward and to the left, allowing lugs (3D) to engage the teeth of the spring loaded gear (2D) of the multiplication dial assembly (3C). As the constant comb (4D) moves to the left, cam slot (9C) contacts pin (8C) causing a parallel forward movement of the two ends of comb (4D). This provides for the simultaneous locking of all multiplication dial gears (2D). If a multiplication dial (3C) has been previously displaced through a set-up, the connecting spring (1D) will allow the multiplication dial (3C) to count out to zero but as gear (2D) is retained in its displaced position, multiplication dial (3C) will be returned to the original set-up figure as its positioning pawls are released during the next clearing operation.

ADJUSTMENT

Adjust lock (6D) by bending to secure a full hold on blank (5D) when the sub-carriage is out of its #1 position. With the sub-carriage in its #1 position and latched over plate (Z2), but held to the left, make sure (6D) is unlatched. If necessary, remove stock from lever (6D) at (2E), as shown in Inset #2.

Adjust pin (8C) through bracket (3E) to provide parallel movement of comb (4D). This parallel movement is very important. Loosen the screw on the left hand end of the sub-carriage shaft, shown in Inset #1, and adjust the off-set of (4E) to provide 1/32" clearance between the rear prong and the tip of comb (4D). Make this adjustment with the constant lever (9D) rearward and the carriage seated. Ascertain that the constant comb (4D) is absolutely free and rides snugly against the bottom of the carriage partition plates.

Adjust extension (8D) by bending, to move lugs (3D) into full engagement with gears (2D) and to move bottom of slot (9C) fully against pin (8C) without cramping and without contacting the rim of the multiplication lials (3C) with constant lever (9D) positioned fully forward. Make sure that with the constant lever (9D) rearward, there is safe clearance between lugs (3D) and gear teeth (2D).



The automatic shifting of the carriage by the use of the C.P. Set-Up key and the return of the carriage after a CX multiplication, is accomplished through the shift key pull-down arm (7E), Figure #30. This arm is positioned by the index plate (1F) through the shift reversing rocker (XX) to engage either of the studs (9E) on the shift keys (5E). With the index plate (1F) positioned fully forward (as illustrated), the outer stud (9E) will be engaged by arm (7E) for a carriage shift to the right. With the index plate (1F) positioned fully rearward, the inner stud (9E) will be engaged by arm (7E) for a carriage shift to the left.

The shift key pull-down arm (7E) is pivoted upward or downward by link (U3) through the rocking of the clearout shaft (U5).

Shift positioner disabling arm (6E) is provided to prevent the pull-down arm (7E) from engaging studs (9E) and attempting to further shift the carriage after it has reached either extreme position, Figure #31.

ADJUSTMENT

The shift key pull down arm (7E) should be adjusted by bending extension (NN) of toggle breaking arm (MM) inward or outward so arm (7E) has safe clearance from studs (%E) with the index plate (1F) positioned fully forward and fully rearward, shown in Inset. This adjustment must be made after the shift reversing rocker (XX) and the outside carriage return lever (QQ) have been properly adjusted, Figures #4 and #31.

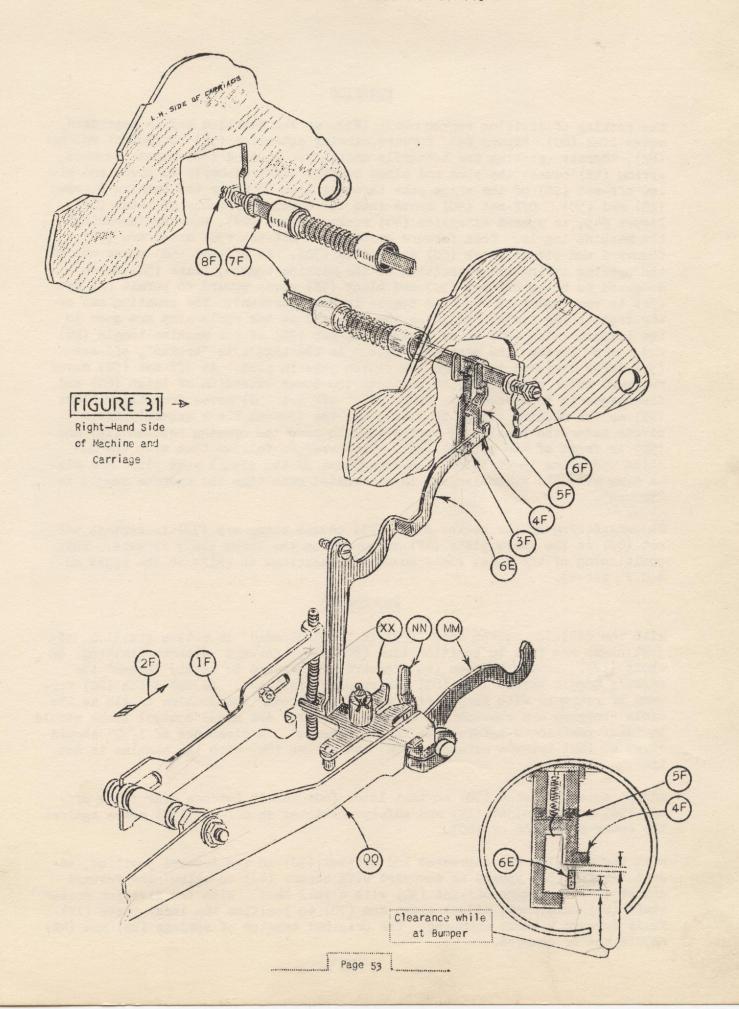
Arm (7E) must have a safe sidewise hold on each of the stude (9E). Determine that index plate (1F) is fully positioned forward or rearward and arm (QQ) is raised when making this adjustment.

Arm (7E) must also raise high enough to safely clear stude (9E) and pull the shift keys fully downward. Bend link (U3) at off-set (8E) to obtain these conditions.

Shift positioning disabling arm (6E), Figure #31, has been provided to prevent the carriage from attempting to shift beyond its limit when the C.P. Set-Up key is operated and the index plate (1F) calls for further movement of the carriage. As the carriage moves to its extreme left hand position, screw (6F) contacts the shift control bar (7F). This bar positions off-set (4F) of the flexible stop (5F), above the disabling arm (6E), and thereby blocks shift rocker (XX) which prevents further attempts to shift the carriage to the left upon depression of the C.P. Set-Up key.

ADJUSTMENT

Screw (6F) should be set to move bar (7F) as far to the left as possible so that lug (4F) of stop latch (5F) will position above arm (6E) to prevent its upward movement when the carriage is in the extreme left hand position and slide (1F) is rearward in direction of arrow (2F) and the cycle stop arm is at the bumper. When the carriage is in its extreme right hand position and slide (1F) is forward, lug (3F) of stop latch (5F) should position under arm (6E) to prevent its downward movement. Adjust screw (8F) inward to move bar (7F) to its right hand limit. If necessary, bend arm (6E) to get clearance shown in Inset. The cycle stop arm should be held at bumper with extension (NN) of the toggle breaking arm (MM) positioned fully, but not limiting, in slot of rocker (XX). The outside carriage return lever (QQ) should be held in its raised position while making this adjustment.



The rocking of division rocker shaft (P5) as the division key is depressed, moves link (8G) Figure #32, forward, causing extension (9H) to contact roller (8H), thereby rocking the butterfly assembly. As stud (3H) moves rearward, spring (4H) causes the plus and minus control blank assembly to pivot and allow off-set (9G) of the minus yoke throwing link to enter the opening between (1H) and (5G). Off-set (9G) moves into the opening by means of latch (7V), Figure #49, as upward extension (4G) rocks the arm (2J), thereby "breaking" the machine toggle. This forward movement of off-set (9G) moves arm (1H) downward and pivots latch (6G) above stud (7G). As off-set (9G) moves out of the opening during the re-setting of the machine toggle, blank (5G) moves downward to block off-set (9G) and blank (7H) moves upward to permit off-set (5H) to pass under it when the toggle is next "broken". The counting out of the registering dials originates the trip and as the cycle stop arm goes to the bumper, latch (2G) moves against off-set (3G) of the machine toggle (R6) and again "breaks" the machine toggle. As the toggle is "broken", off-set (5H) moves rearward to engage the clutch yoke in plus. As off-set (5H) moves rearward under blank (7H), it contacts the lower extension of latch (6G) and disengages it from eccentric stud (7G). Off-set (5H) moves from under blank (7H) as the machine toggle is re-set and the control blank assembly again pivots under the tension of spring (4H) to move the opening between (1H) and (5G) in front of the off-set (9G). It therefore follows that with the machine operating in division, the engagement of the clutch yoke plus and minus arms with the transmission is alternated each time the machine toggle is "broken".

The unlatching of the rocker shaft (P5) causes clamp arm (7J) to contact offset (6J) of the index plate (1F) and position the index plate forward. This positioning of the index plate causes the carriage to shift to the right on a C.P. set-up.

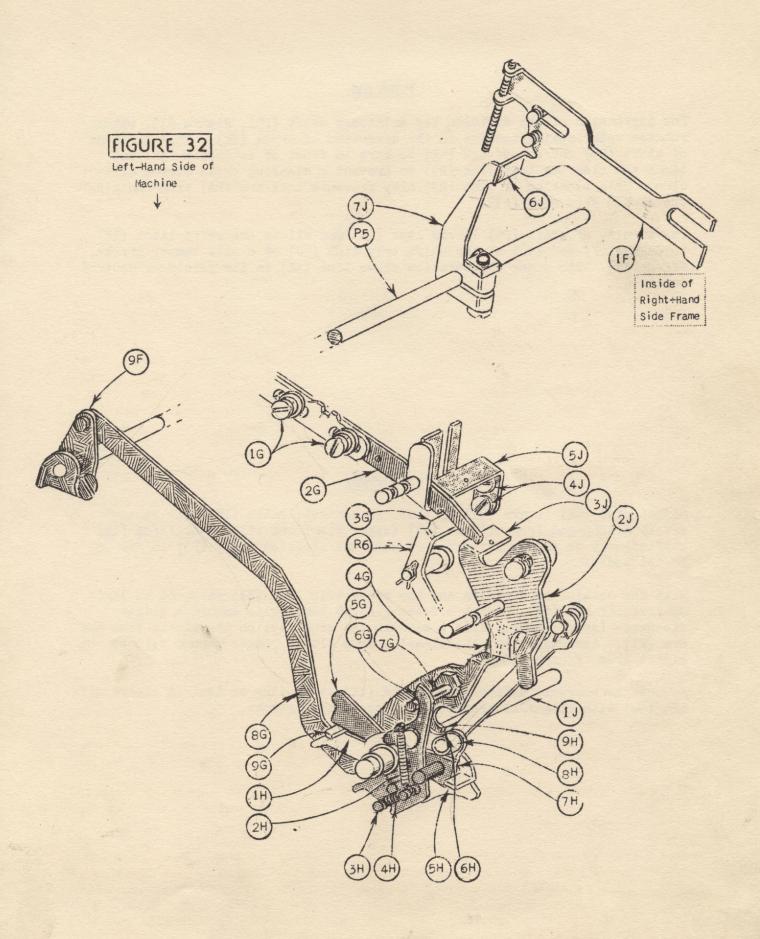
ADJUSTMENT

With the division rocker shaft (P5) in its "unloaded" or active position, adjust clamp arm (9F) to position link (8G) fully forward without limiting on shaft (1J). Bend extension (4G) forward or rearward to safely "break" the machine toggle before link (8G) has reached its limit. Adjust latch (2G) forward or rearward with screws (1G) to safely "break" the machine toggle as the cycle stopping arm reaches the bumper. The plus and minus control blank should be fully positioned before this toggle "breaks". A clearance of 1/32" should exist at (6H) between extension (9H) and roller (8H) with the machine in neutral.

Adjust eccentric stud (7G) so that latch (6G) safely latches over it as off-set (9G) moves against (1H) and safely unlatches as off-set (5H) moves against the lower extension of (6G).

With the division key depressed and off-set (3J) in its lowered position, adjust bracket (5J) upward or downward with screws (4J) to allow the forward end of (2G) to engage off-set (3G) with a full hold. With the division rocker shaft (P5) unlatched, adjust clamp arm (7G) to position the index plate (1F) fully forward without cramping. The original tension of springs (2H) and (4H) should not be changed.

0 1	
Page 511 :	



The depression of the division key unlatches shaft (P5), Figure #33, which rotates under spring tension in the direction of arrow (7K). This movement of shaft (P5) causes off-set (4K) to move in front of extension (3K) and block the clearing trip link (B3) to prevent a clearing cycle during division. This blocking of link (B3) also prevents lock arm (R1) from engaging the clutch yoke stud (A7).

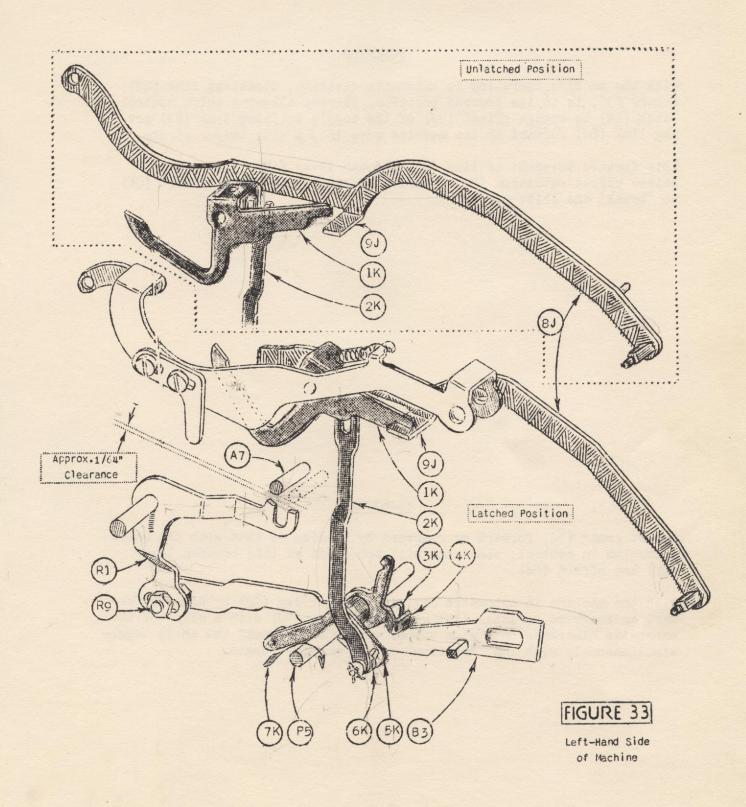
The turning of shaft (P5) lowers link (2K) and allows the shift latch (1K) to engage off-set (9J) of the shift trip link (8J) on a plus bumper stroke, Figure #33. The upper illustration shows link (1K) in its raised or neutral position.

ADJUSTMENT

Adjust stud (6K) in arm (5K) so that, in neutral, latch (1K) will remain safely disengaged from off-set (9J) (upper view) and will lower latch (1K) sufficiently to engage off-set (9J) with the division shaft (P5) in its unloaded position.

With the machine in division and the clear trip link (B3) released to limit against off-set (4K), adjust off-set (4K) by bending to secure a slight clearance (approximately 1/64") between the stud (A7) on the clutch yoke and arm (R1). Ascertain that the clearing drum clutch finger cannot release the clutch drum, Figure #15.

Adjust the rearward extension of latch (1K) by bending so that it clears offset (9J) with slight clearance on a minus bumper stroke.



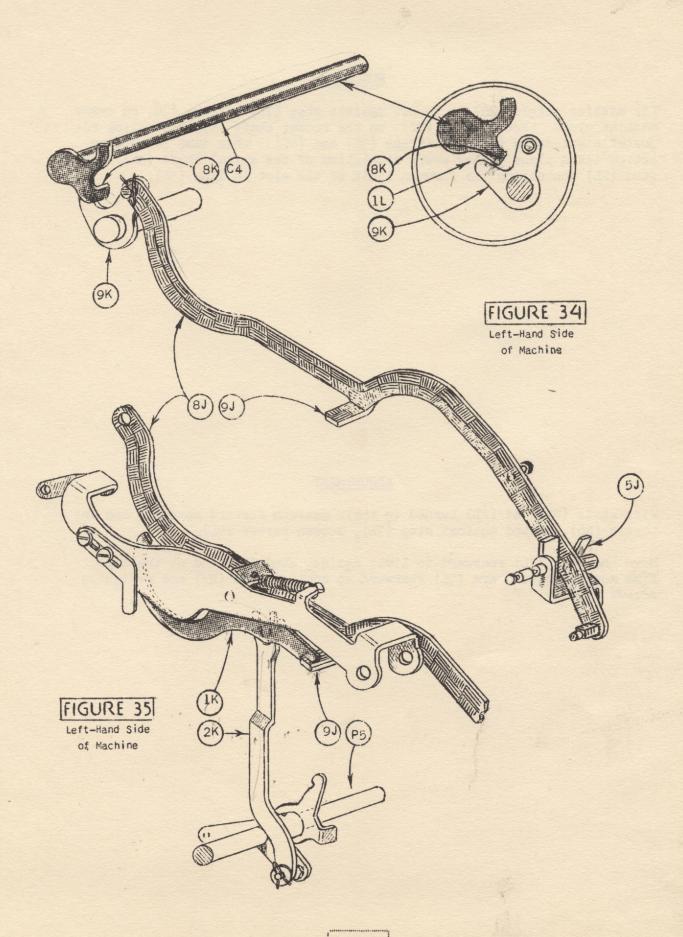
With the machine operating in automatic division, disabling link (2K), Figure #35, is in its lowered position, thereby allowing shift control latch (1K) to engage offset (9J) of the toggle tripping link (8J) moving link (8J) forward as the machine goes into a plus bumper stroke.

This forward movement of link (8J) through lever (9K), Figure #34, raises offset extension (8K), thereby rocking shift control shaft (C4) to "break" the shift toggle.

ADJUSTMENT

Adjust prong (5J) forward or rearward by bending so that with the shift mechanism in neutral, clearance will not exist at (1L) between lever (9K) and offset (8K).

With the machine in automatic division, adjust lug (9J) by bending forward or rearward so latch (1K) will engage lug (9J) with a safe, but not excessive clearance on a plus bumper stroke and "break" the shift toggle simultaneously with the "breaking" of the machine toggle.

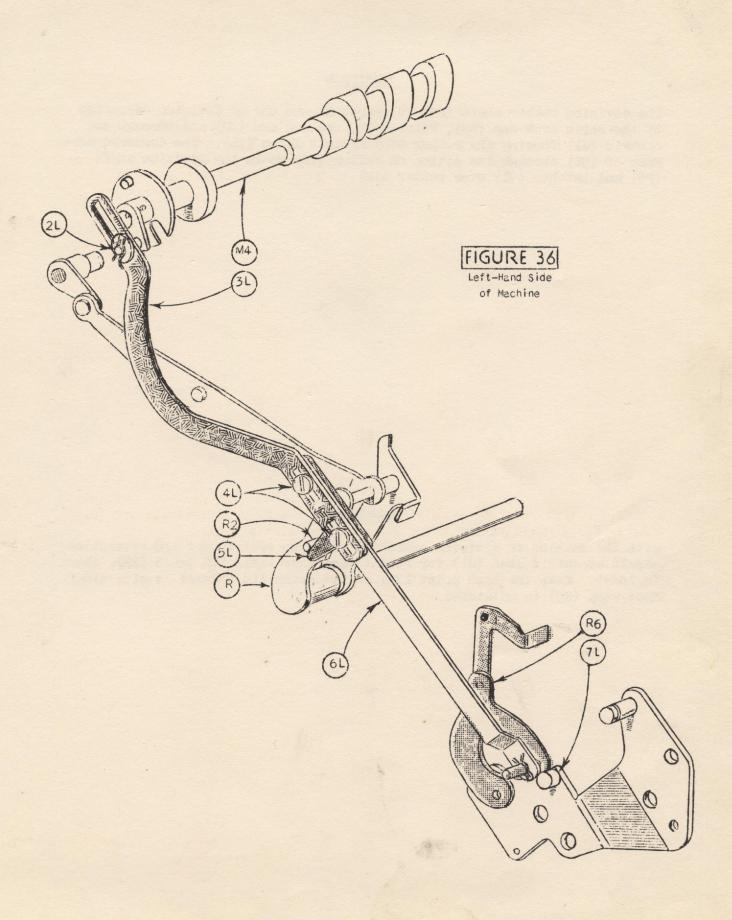


The machine toggle (R6) is re-set against stop (7L) Figure #36, on every machine cycle through stud (R2) on the rocker shaft (R), contacting adjustable extension (5L) of linkage (3L) and (6L). This same re-setting action takes place during every revolution of the spiral shaft (M4) through stud (2L) contacting the forward limit of the slot in link (3L).

ADJUSTMENT

With studs (R2) and (2L) turned to their maximum forward movement and the toggle (R6) limited against stop (7L), loosen screws (4L).

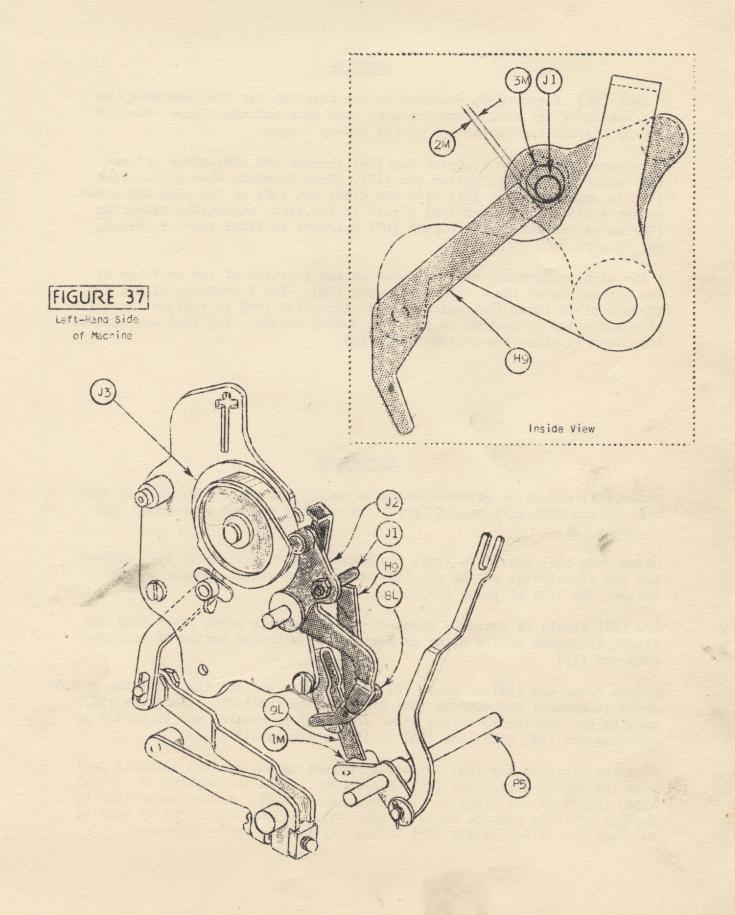
Move the link (3L) rearward to limit against stud (2L) and at the same time move extension arm (5L) rearward to contact stud (R2) and retighten screws (4L).



The division rocker shaft (P5) is re-set at the end of division operation by the shift drum cam (J3), Figure #37, rocking arm (J2) and through eccentric (J1) forcing the roller (8L) against latch (9L). The downward movement of (9L) through its action on roller (1M) rocks the division shaft (P5) and latches (9L) over roller (1M).

ADJUSTMENT

With the machine in division operation and drum (J3) turned 1/8 revolution, adjust eccentric stud (J1) for slight clearance (2M) with latch (H9), shown in Inset. Keep the high point (3M) of the eccentric forward to give clearance when (H9) is unlatched.



A lock (4N), Figure #38, operated by the division key (4M) prevents the depression of the multiplication keys, the plus and minus keys, the C.P. Set-Up key and the "breaking" of the set-up toggle.

The depression of the division key (4M) through arm (8M) moves off-set (9N) under the multiplication arm (1P). This movement also pivots lock (4N) to engage cut-out (6N) with the clamp arm (5N) on the plus and minus rocker shaft (D). As arm (4N) pivots to the left, adjustable extension (7N) moves the set-up slide lock (D7) rearward to block the C.P. Set-Up key, Figure #42.

A division problem may be terminated at any position of the carriage by the depression of the division stop key (5M). The depression of key (5M) through pivot lever (6M) raises the division key (4M) to restore the division mechanism to neutral on the next bumper stroke. Key (5M) may also be depressed to close the switch blades (B9).

ADJUSTMENT

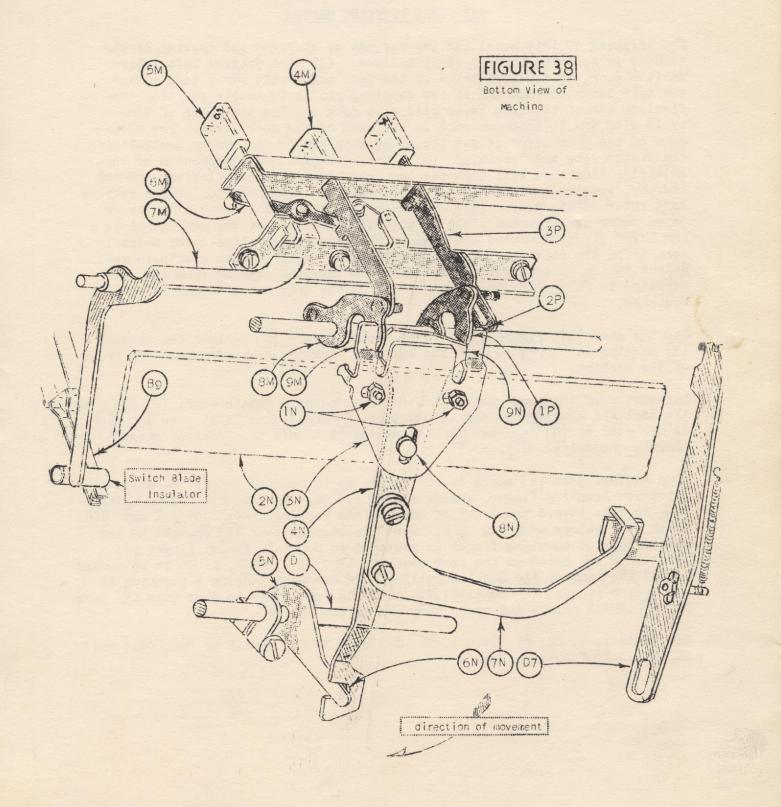
Guide (3N) should be adjusted sidewise at (1N) on plate (2N) so that the side of arm (8M) will have a very light rubbing contact with prong (9M) of guide (3N).

Adjust arm (1P) upward to limit the minus multiplication key (3P) against the top plate; also adjust arm (1P) endwise for slight rubbing contact against the side of prong (2P) of guide (3N).

Arm (4N) should be moved by means of its adjustable pivot point (8N) for slight clearance of its upper extension (9N) with the bottom of the arms (8M) and (1P).

Adjust clamp arm (5N) on shaft (D) to center in cut-out (6N) with the rocker shaft in neutral and cut-out (6N) displaced to the left. Clamp arm (5N) must be set endwise to safely clear lock (4N) in neutral and to safely engage cut-out (6N) with lock (4N) in its active position.

With the division key (4M) depressed, adjust extension (7N) to fully position the set-up slide lock (D7), Figure $^{\prime\prime}_{1}$ 42. With the machine in neutral, slide (D7) must not limit on the extension of (7N). Adjust lever (6M) by bending to fully restore division key (4M). Adjust lever (7M) by bending to close the switch blades (B9) before key (5M) is fully depressed.



THE THREE TRIPPING MEDIUMS

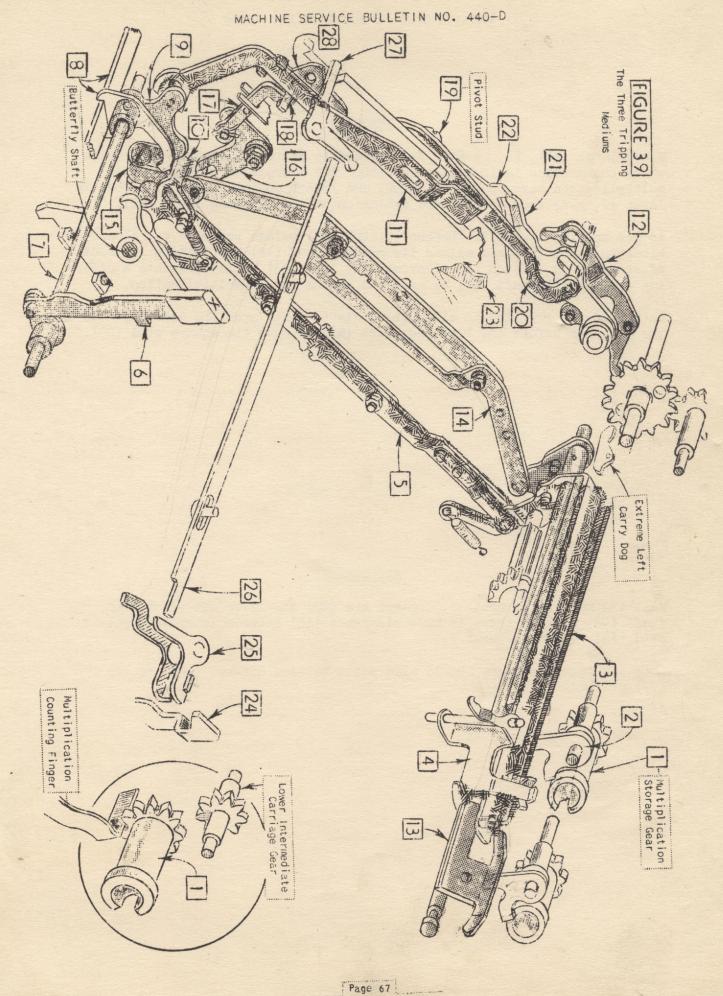
The tripping of this model for the purpose of stopping the cycling of the machine is achieved through three mediums. (I) The extreme left intermediate gear, driven from below by the last main shaft carry dog. causes the trip lever to rock and if its coupling pin is in active position, the flexible end of the trip lever will also rock causing the latch of the cycle stop arm to drop downward in the path of the rock lever. The movement of the rock lever drives the cycle stop arm to the bumper, neutralizing the clutch yoke and "breaking" the locator toggle. The depression of the multiplication keys will uncouple the trip lever from its flexible end and thereby, prevent any movement of the trip lever from rotation of the extreme left intermediate gear. (II) Action of the keyboard release lever is relayed under the keyboard plate to the left hand side of the machine where a cam lever pivots downward and engages the trip rocker slide-lever which in turn trips the flexible end of the trip lever. (III) When a trip is required during automatic multiplication, the tripping impulse from the subcarriage is relayed to the flexible end of the trip lever in the following sequence.

Storage gear 1, Figure #39, forces feeler finger 2 against feeler bail 3 causing latch 4 to hold the bail and link 5 forward toward the front of the machine.

Depression of the minus multiplication key 6 will rotate shaft 7 and rock the bail and arm 8 and arm 9, causing 8 and 9 to latch over lug 10 as the stud of 9 engages 11 and slides it toward the front of machine thereby uncoupling 12.

When storage gear 1 moves to the right, to be counted out by the multiplication counting finger, feeler finger 2 engages cam 13 causing link to move toward the front of machine and rocking shaft 15 and arm 16. Latch 17 raises over lug 18. When the storage gear 1 engaged by the multiplication counting finger is restored to neutral, feeler finger 2 moves into the notch in the gear causing 13, 14, 15, & 16 to be rocked toward the rear of the machine pulling 17 downward causing a pivoting at 19 which causes 20 to trip 21 allowing latch 22 to drop into the path of 23 which drives the cycle stop arm to the bumper.

See pages 6, 7, 82, 83, 84, 85, 86, 87, 88 & 89 for detail of functions and adjustments of this mechanism.



Block latch (R8), Figure #40, is provided to prevent a clearing operation while the machine is in multiplication. The depression of any of the multiplication keys rocks shaft (9P) and lowers control arm (8P), shown in Inset #2, away from the forward extension of the blocking latch (R8).

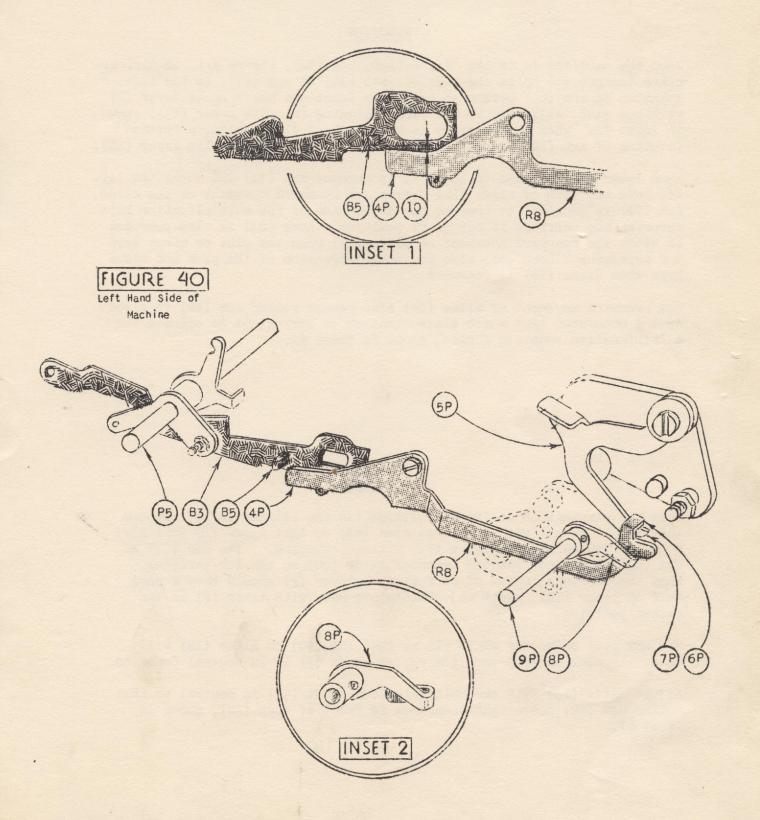
As the machine toggle is "broken", latch (5P) swings rearward to release blocking latch (R8) and allows its rearward end (4P) to position in front of square stud (B5) on the clearing trip link (B3). This prevents a clearing cycle until shaft (9P) is restored at the end of multiplication.

Latch (5P) is provided to allow the dials to clear upon the depression of the C.X. key before the blocking latch (R8) engages the square stud (B5).

ADJUSTMENT

With the machine in neutral, control arm (8P) should be set-screwed on shaft (9P) so that there is safe clearance (1Q) between latch (4P) and stud (B5), shown in Inset $\frac{\mu}{\pi}$ 1.

Safe latching clearance should also exist between off-set (6P) and tip (7P) of latch (5P).



When the carriage is in its #1 position, lug (5Q), Figure #41, on the carriage engages and holds the rear off-set (3Q) of arm (6Q), to the left. Inasmuch as arm (6Q) pivots at (4Q), its front end which holds lever (P) within a slot, will move to the right aligning (P) with lever (Y3), shown in Inset #2. When the carriage is moved out of #1 position, a reverse pivoting of arm (6Q) occurs and lever (P) is then aligned with lever (EE).

When lever (P) is moved to the left it engages arm (7Q) and moves the latter into the path of slide (1R) preventing rearward movement of the slide. Arm (7Q) is provided to prevent the depression of the multiplication keys whenever the carriage is out of #1 position. Lock (8Q) is also provided to block the rearward movement of slide (1R) when the plus or minus keys are depressed. Lock (8Q) also prevents depression of the plus and minus keys when slide (1R) is rearward.

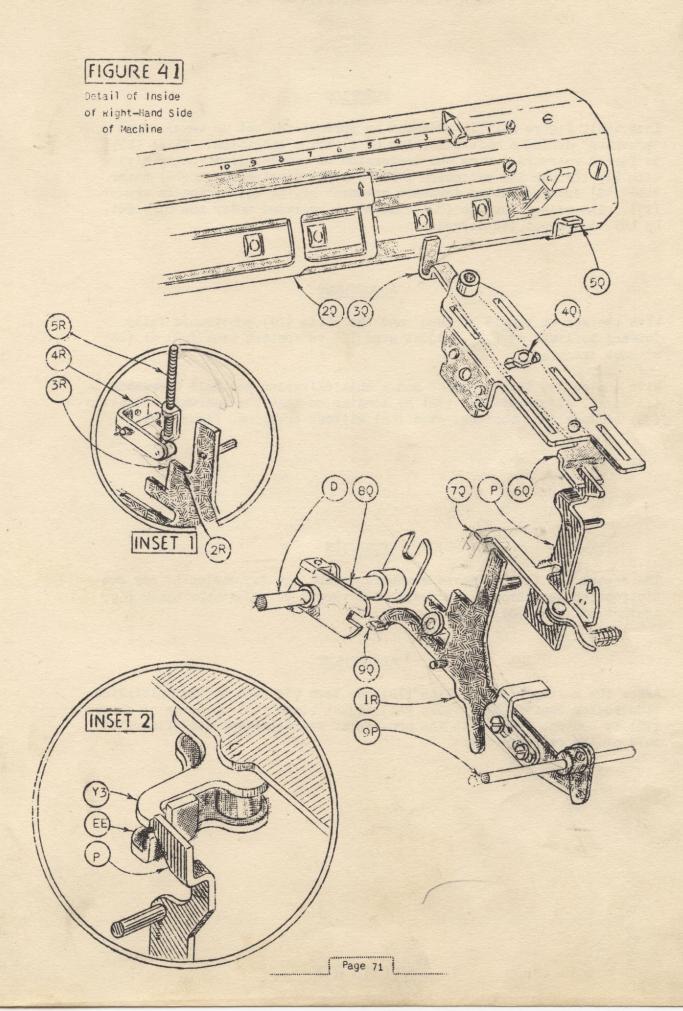
The rearward movement of slide (1R) also causes roller arm (4R) to pivot upward onto step (2R) which places tension on spring(5R) to operate the multiplication counting finger, shown in Inset #1.

ADJUSTMENT

When the carriage is in its #1 position (to the extreme left), the arm (6Q) should be set with the pivot stud (4Q) so that lever (P) will have a good sidewise hold on lever (Y3) without cramping. The end (3Q) of arm (6Q) should not rub the transfer slide (2Q) on the sub-carriage. When the carriage is out of #1 position, lever (P) should have a good hold on lever (EE). Both adjustments are made with lever (P) in its raised position.

Set arm (8Q) on rocker shaft (D) so that lug (9Q) on slide (1R) will enter the slot in (8Q) when the rocker shaft (D) is in neutral position.

Adjust slide (IR) with the multiplication shaft (9P) in neutral so that roller arm (4R) has slight clearance in front of step (3R), shown in Inset #1.



Lock (6R), Figure #42, is provided to prevent the set-up toggle from "breaking" during a multiplication or division operation. Slide (D7) is forced rearward during the depression of a multiplication or division key through its extension (7R), thereby pivoting lock (6R) under stud (4S) and preventing downward movement of the set-up toggle arm (X7). The raised surface (8R) also moves rearward under the C.P. Set-Up key to prevent its depression.

ADJUSTMENT

With the set-up toggle "broken" and the slide (D7) positioned fully forward to limit at (9R), adjust stud (LS) to contact lock (6R) at (2S) without cramping.

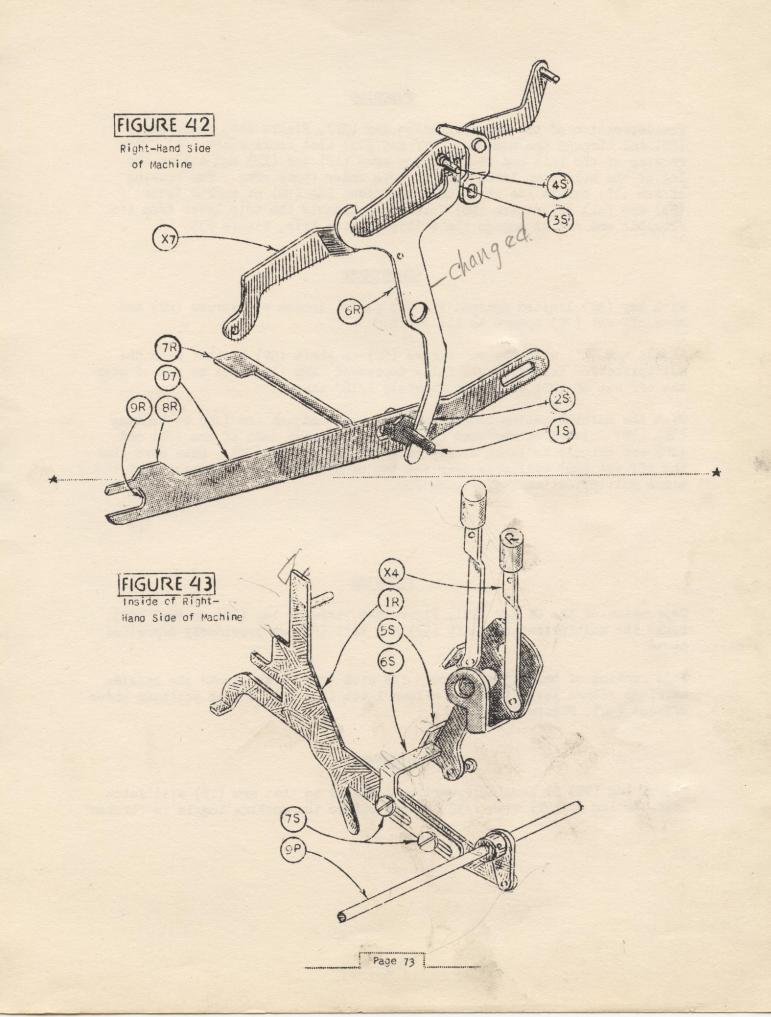
With the set-up toggle "made" and a multiplication key held depressed to its limit, adjust off-set (7R) by bending so that the rearward extension (3S) of lock (6R) contacts stud (4S) without cramping, Figure #24.

FUNCTION

The repeat key (X4) is moved downward during the depression of any multiplication key through the rearward movement of adjustable blank (6S) against off-set (5S), Figure $\frac{\pi}{6}$ 43.

ADJUSTMENT

After the multiplication slide (IR) has been adjusted to the multiplication rocker shaft (9P), Figure #41, adjust blank (6S) by means of screws (7S) to contact (5S), with the non-repeat key depressed and slide (IR) held at its rearward limit.



The depression of the multiplication key (3T), Figure #44, rocks bail (8T) and through the medium of off-set (7T) also rocks shaft (9P). The rocking of the bail and shaft raises arms (1T) and (1U) and allows the lug of the hold down latch (2T) to move under these arms. The rocking of arm (1T) causes its stud (8S) to contact lug (9S) of rocker lever (BB) and pull this lever (BB) forward to disable the trip lever from its flexible end and to engage the multiplication trip, Figure #39.

ADJUSTMENT

With key (3T) limited against the top plate, loosen set screws (6T) and move off-set (7T) upward to its limit.

Adjust arm (IT) with its set screws (9T) on shaft (9P) so that with the multiplication key (3T) held fully depressed, arm (IT) will be raised over the off-set of (2T) with approximately 1/16" excess.

With the multiplication mechanism in neutral, adjust arm (1U) by bending bail (8T) forward or rearward so that the rearward ends of arm (1T) and (1U) are aligned to latch evenly over the off-set of (2T). Make sure that the off-set (2T) will pass over the top of arm (1U) upon depression of the minus multiplication key, Figure #50.

FUNCTION

Depression of the CX key (2U), Figure #45, through lug (4T) on bail (5T), rocks the multiplication shaft (9P) and bail (8T) as previously described above.

This rocking of bail (5T), through its stud (3U), also pivots the outside carriage return lever (QQ) and allows latch (4U) and (6U) to position under off-set (5U), Figure #46.

ADJUSTMENT

Adjust lug (4T) by bending upward or downward so that arm (1T) will latch over the lug of (2T) with 1/32" excess before the machine toggle is "broken".

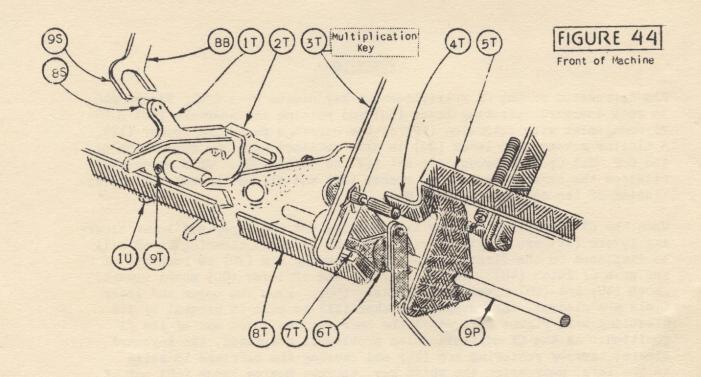
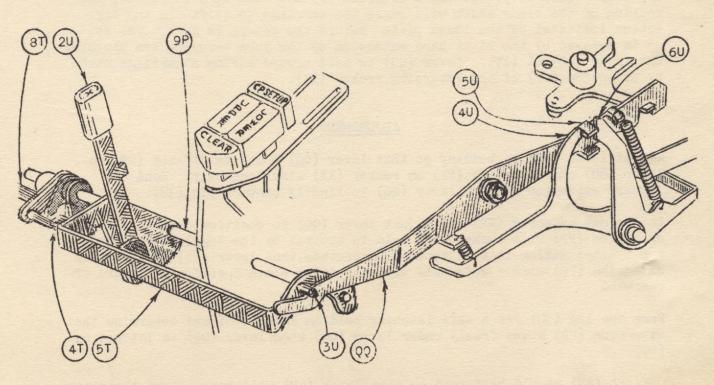


FIGURE 45

Right-Hand Front of Machine



The depression of the CX multiplication key causes stud (3U), Figure #46, to rock downward, pivoting lever (QQ) and raising the aperture (9U) out of engagement with extension (PP) of the carriage reversing rocker (XX). A similar movement of lever (QQ) is also obtained upon the depression of the C.P. Set-Up key through off-set (2V) on lever (8U). This movement releases the carriage reversing rocker (XX) and allows the automatic positioning of the carriage, Figure #30.

When the CX multiplication key is depressed and the upper and lower clearing levers (4V) are displaced rearward, the keyboard clearing lever will be displaced on the first machine cycle causing arm (7U) to rock out of the path of latch (4U). As the rearward end of lever (QQ) moves upward, latch (4U) and (6U) moves under off-set (5U). When the upper and lower dials are cleared, the reversing rocker (XX) is held in neutral by its disabling arm, Figure $\frac{1}{1}$ 31, until the carriage has moved out of its $\frac{1}{1}$ 1 position. As the CX multiplication problem is completed, the keyboard clears, thereby restoring arm (4U) and causing the carriage to shift to the left depressing the shift key, thereby moving latch (6U) out of engagement with lug (5U) and allowing the lever (QQ) to drop down and rest on extension (PP), shown in Inset.

As the cycle stop arm is driven to the bumper at the completion of the carriage shift, rocker (XX) is neutralized and aperture (9U) drops over extension (PP). Arm (8U) pivots off-set (2V) upward on depression of the C.P. Set-Up key thus camming latch (6U) away from off-set (5U) and allowing rocker (XX) to pivot. If a clearing key has also been depressed, the rocking of the clear shaft will cause the carriage to shift in the direction indicated by the index plate before the set-up is made. The set-up is delayed by the right hand extension of the yoke throwing arm blocking the lever (QQ) at (1V). Lever (QQ) is held upward during a carriage shift by extension (PP) of the reversing rocker (XX).

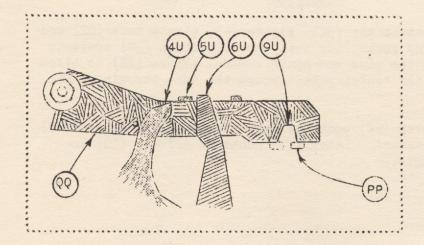
ADJUSTMENT

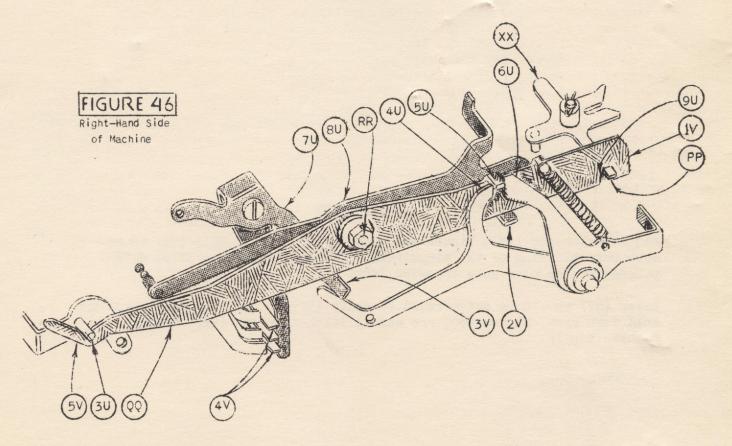
Adjust lever (8U) by bending so that lever (QQ) contacts off-set (2V) on lever (8U) and extension (PP) on rocker (XX) simultaneously. Bend the forward extension (5V) of lever (QQ) to lightly contact pin (3U).

Loosen nut on screw (RR) and adjust lever (QQ) to position centrally over extension (PP) with rocker (XX) held in neutral by the toggle "breaking" arm. After making this adjustment, ascertain that lever (QQ) will rest on extension (PP) with a safe hold with the index plate positioned forward or rearward.

Form the lug (5U) for a safe latching hold on latch (4U) and determine that extension (PP) moves freely under lever (QQ) when lever (QQ) is latched on (4U).

Off-set (3V) should be formed so that latch (4U) will have slight clearance with off-set (5U) when all clearing slides are in neutral.





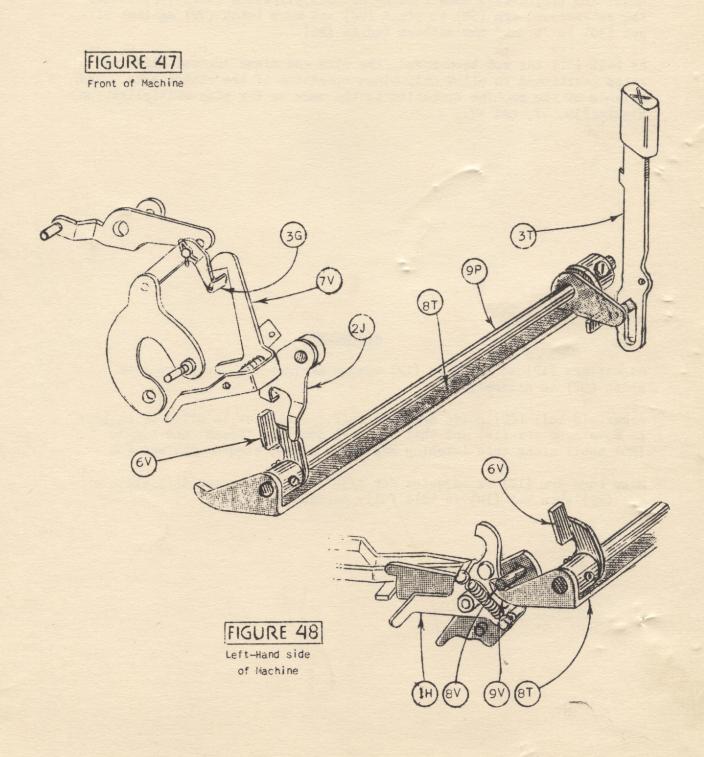
Depression of multiplication key (3T), Figure #47, pivots bail (8T) and shaft (9P). As bail (8T) rocks, its left hand extension (9V) contacts stud (8V) and positions the plus and minus control blanks (1H) to allow plus operation (only) of the clutch yoke through the yoke throwing links, Figure #48.

As shaft (9P) rocks, lever (6V) contacts toggle trip operating arm (2J) and moves latch (7V) downward. Latch (7V) contacts off-set (3G) to "break" the machine toggle.

ADJUSTMENT

Adjust extension (9V), Figure #48, upward by twisting bail (8T) to secure safe blocking of the minus yoke throwing link and to allow safe passage of the plus yoke throwing link.

Lever (6V) should be set-screwed to shaft (9P) so that the multiplication hold down arms, Figure #50, are safely latched before (7V) "breaks" the machine toggle.



Page 79

The depression of the minus multiplication key (lW), Figure #49, rocks the multiplication shaft (9P) but does not move the bail (8T). Therefore, as hold-down latch (2T) moves forward, it moves over arm (lV) and under arm (lT). This same rocking of multiplication shaft (9P) causes the set-screwed arm (6V) to pivot (2J) and move latch (7V) against off-set (3G) to "break" the machine toggle (R6).

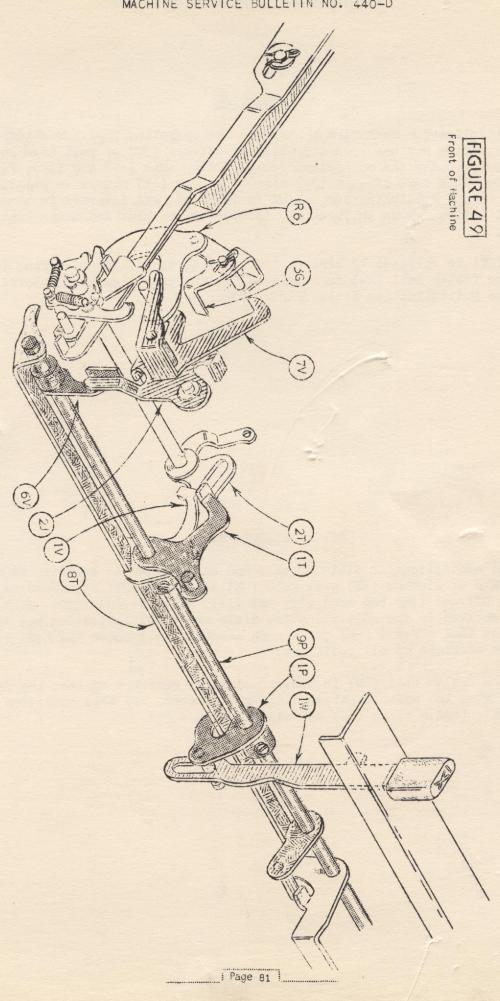
As bail (8T) has not been moved, the plus and minus control blank remains positioned to allow only minus operation of the clutch yoke. The balance of the machine operation is the same as for plus-multiplication, Figures#39, 41, and 47.

ADJUSTMENT

Adjust arm (1P) to hold key (1W) upward against the top plate with shaft (9P) in neutral.

Ascertain bail (8T) holds arm (1V) sufficiently low to allow latch (2T) to move over arm (1V) and that arm (6V) does not "break" the toggle (R6) until after this latching has taken place, Figures #47 and #50.

Make sure arm (1T) is adjusted for 1/32" to 1/16" excess lift above offset (2T) when key (1W) is held fully depressed.



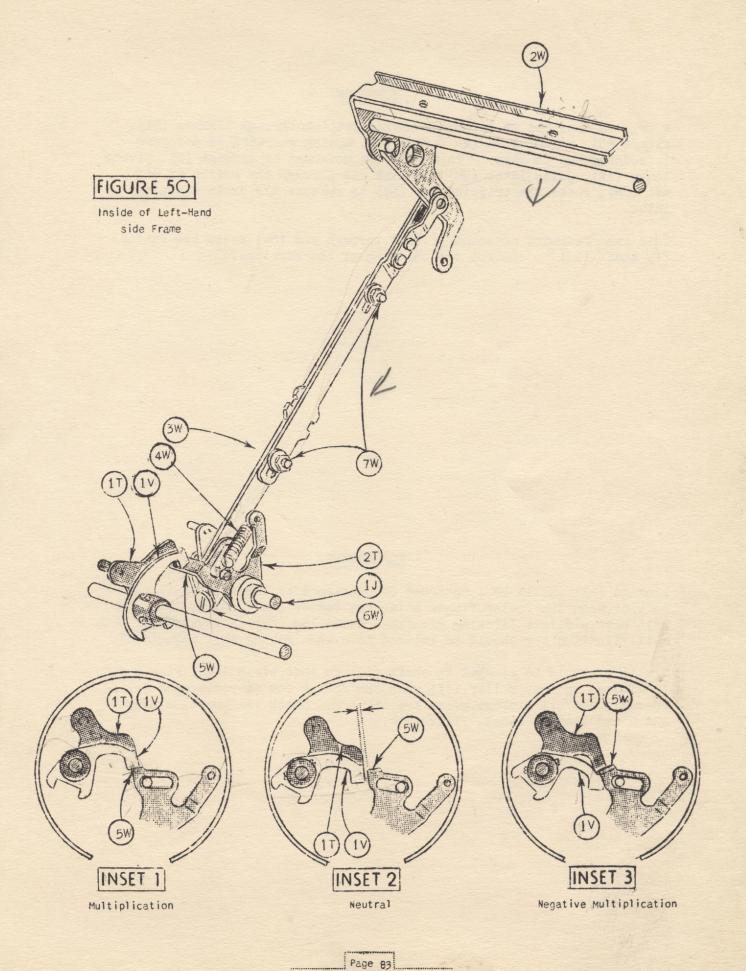
The multiplication mechanism is held in its operating position after a multiplication key has been depressed by off-set (5W) of hold down latch (2T) moving under the multiplication hold down arms (1T) and (1V), Figure #50. This same off-set (5W) also holds arm (1V) upward in multiplication and CX multiplication, shown in Inset #1, and downward in minus multiplication, shown in Inset #3, to operate the plus and minus control blanks.

Latch (2T) is operated by linkage (3W) through the action of spring (4W) when the feeler bail (2W) is displaced forward as a figure is entered into the multiplication dials, Figure $\frac{\pi}{6}$ 56.

ADJUSTMENT

With all multiplication dials at zero and the machine in neutral, adjust the length of linkage (3W) with nuts (7W) so that slight clearance exists between off-set (5W) and arms (1T) and (1V), shown in Inset #2. With a figure entered in the multiplication dials and a multiplication key depressed, determine that off-set (5W) has a safe latching hold under the hold down arms with the carriage in all positions.

Make sure feeler bail (2W) is positioned fully rearward against the feeler fingers when the multiplication dials are at zero. If this condition does not exist, loosen clamp (6W) and adjust, Figure #51.



A trip is obtained in automatic multiplication through linkage (2X), Figure #51, attached to the feeler cam, moving rearward as a figure is counted out to zero. This rearward movement of linkage (2X) pivots lever (1X), pulls latch (9W) downward and through the medium of offset (8W), rocks the tripping arm (BB) to release the cycle stopping latch.

This same rearward movement of (2X) through arm (6W) rocks the butterfly shaft (1J) to control the shifting of the carriage.

ADJUSTMENT

Linkage (2X) should be lengthened or shortened by loosening nuts (3X) so that when the feeler finger holds the feeler cam forward, latch (9W) will have a slight latching clearance above lug (8W) of lever (BB). The multiplication key should be latched down when making this adjustment.

Arm (6W) should be clamped to shaft (1J) so that blank (4X), Figure #52, is limited against collar (5X) when the feeler cam is positioned fully rearward and all storage gears are at zero. Check the position of plus and minus control blank, Figure #54.

Page 84

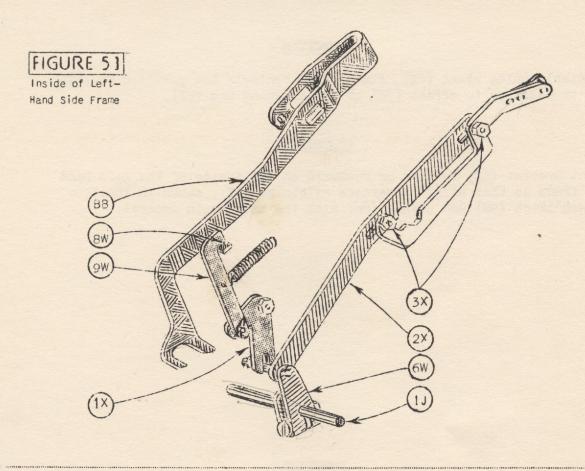
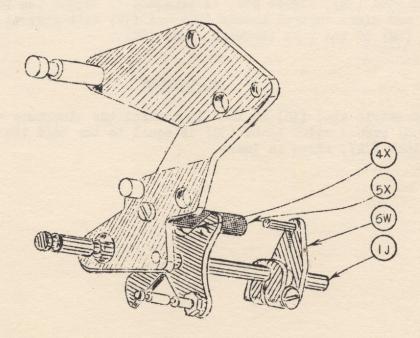


FIGURE 52

Left-Hand Side of Machine



Adjustable guide blank (6X), Figure $\frac{4}{5}$ 53, controls the position of latch (9W) in relation to offset (8W) of the tripping arm (BB).

ADJUSTMENT

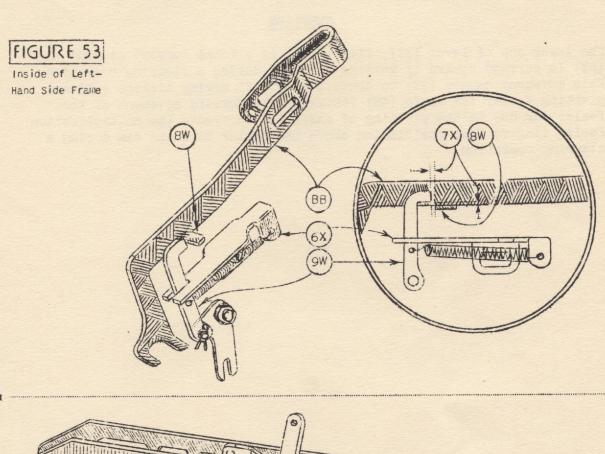
Adjust bracket (6X) forward or rearward on the inside of the left hand side frame so that slight clearance exists at (7X), shown in Inset, between latch (9W) and offset (8W) with the machine in neutral.

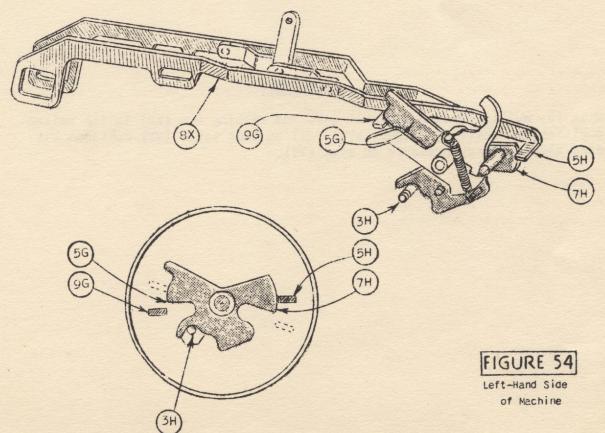
FUNCTION

Eccentric stud (3H), Figure #54, is provided to adjust the position of the plus and minus control blanks (5G) and (7H) with respect to offsets (9G) and (5H) of the yoke throwing links (8X).

ADJUSTMENT

Adjust eccentric stud (3H) so that in neutral the clearance with which offset (9G) passes under blank (5G) is equal to the hold that offset (5H) has on blank (7H), shown in Inset.



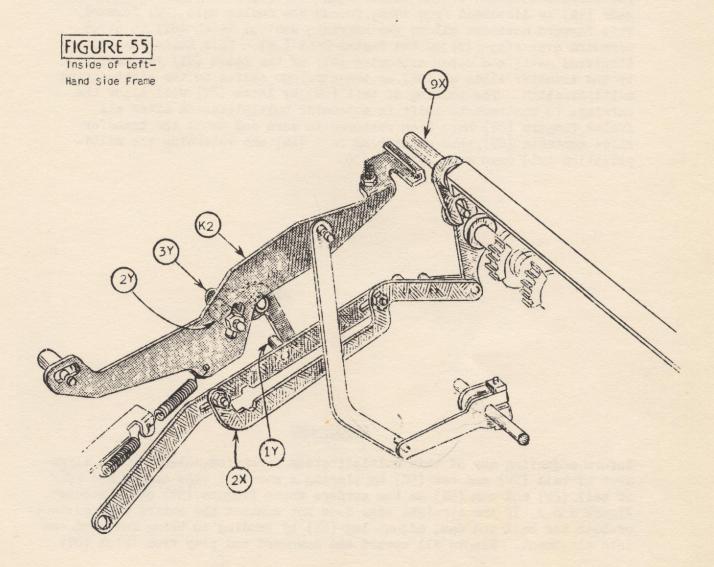


The lower end of lever (3Y), Figure #55, is pivoted forward as stud (2Y) is carried upward by raising arm (K2) during a clearing operation. This movement causes (3Y) to contact stud (1Y) moving linkage (2X) and pivoting feeler cam shaft (9X) forward. The forward movement of the feeler cam due to the pivoting of shaft (9X) prevents the multiplication feeler fingers from positioning above the feeler bail and cam during a clearing operation.

ADJUSTMENT

With the multiplication dials at zero and raising arm (K2) in its raised position for shifting, adjust stud (2Y) so that lever (3Y) contacts but does not exert any pressure on stud (1Y).

Page 88

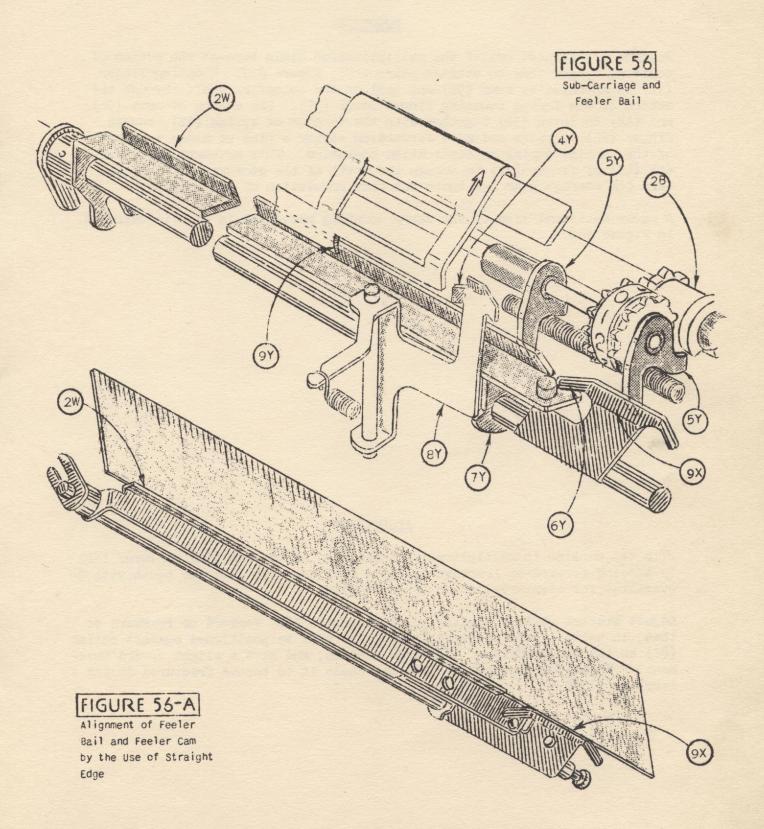


The forward movement of the feeler fingers (5Y), Figure #56, as storage gear (2B) is displaced from zero, forces the feeler bail (2W) forward. This forward movement allows the carriage control latch (8Y) to pivot rearward over step (7Y) on the feeler bail (2W). This holds the bail displaced until the upper extension (4Y) of the latch (8Y) is contacted by the transfer slide at (9Y) as the carriage shifts to the right during multiplication. The holding of bail (2W) by latch (8Y) will allow the carriage to continue to shift in automatic multiplication after all feeler fingers (5Y) have been restored to zero and until the transfer slide contacts (8Y), thus unlatching bail (2W) and releasing the multiplication hold down arms, Figure #50.

ADJUSTMENT

Before adjusting any of this multiplication mechanism, determine the alignment of bail (2W) and cam (9X) by placing a straight edge across the rear of bail (2W) and cam (9X) on the surface where fingers (5Y) are contacted, Figure #56-A. If the straight edge does not contact the entire rear surface of both the bail and cam, adjust lug (6Y) by bending to bring bail and cam into alignment. Remove all upward and downward end play from latch (8Y).

With a figure entered in the multiplication dial, Figure #56, and feeler finger (5Y) holding feeler bail (2W) forward, adjust latch (8Y) to engage latching step (7Y), with a minimum of clearance above (7Y) and a safe latching hold on (7Y) when the transfer slide is out of engagement with latch (8Y). Adjust (8Y) to unlatch bail (2W) safely when (4Y) is contacted by edge (9Y) of the transfer slide.



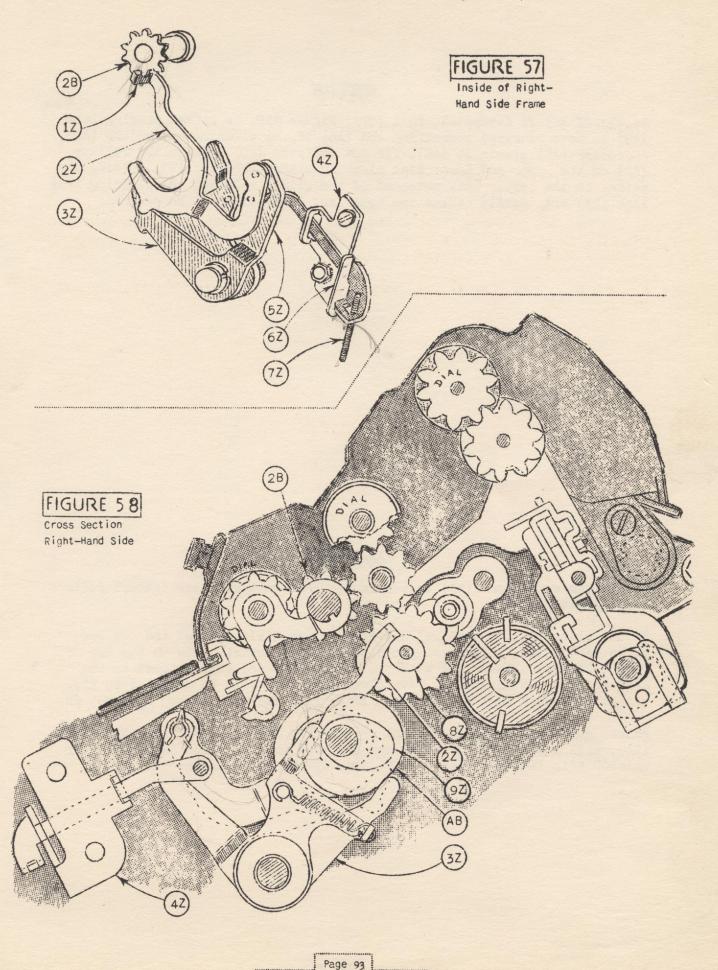
Figures are counted out of the multiplication dials through the action of counting finger (2Z) on storage gears (2B), Figure #57. Counting finger (2Z) is actuated by cams (9Z) and (AB) on the selecting shaft through the action of the forked counting finger lever (3Z). The action of cams (9Z) and (AB) on lever (3Z) together with the tension of spring (7Z), causes finger (2Z) to raise and move forward on either a plus or minus revolution of the machine during multiplication operation. This movement allows offset (1Z) of finger (2Z) to engage the teeth of the storage gear (2B) and turn the storage gear one tooth for each revolution of the machine.

A cross sectional view of the carry counting mechanism is also illustrated in Figure #58.

ADJUSTMENT

With the machine in multiplication operation, adjust arm (5Z) of lever (3Z) by bending forward or rearward to fully displace gear (2B) one tooth, without overthrow, for every revolution of the machine.

Adjust bracket (4Z) by bending guide extension (6Z) forward or rearward so that, in neutral, the counting finger (2Z) will be positioned against collar (8Z) on the front shaft of the wedge section, and have a slight upward movement. Excessive movement of (2Z) may cause it to become fractured during a carriage shift.



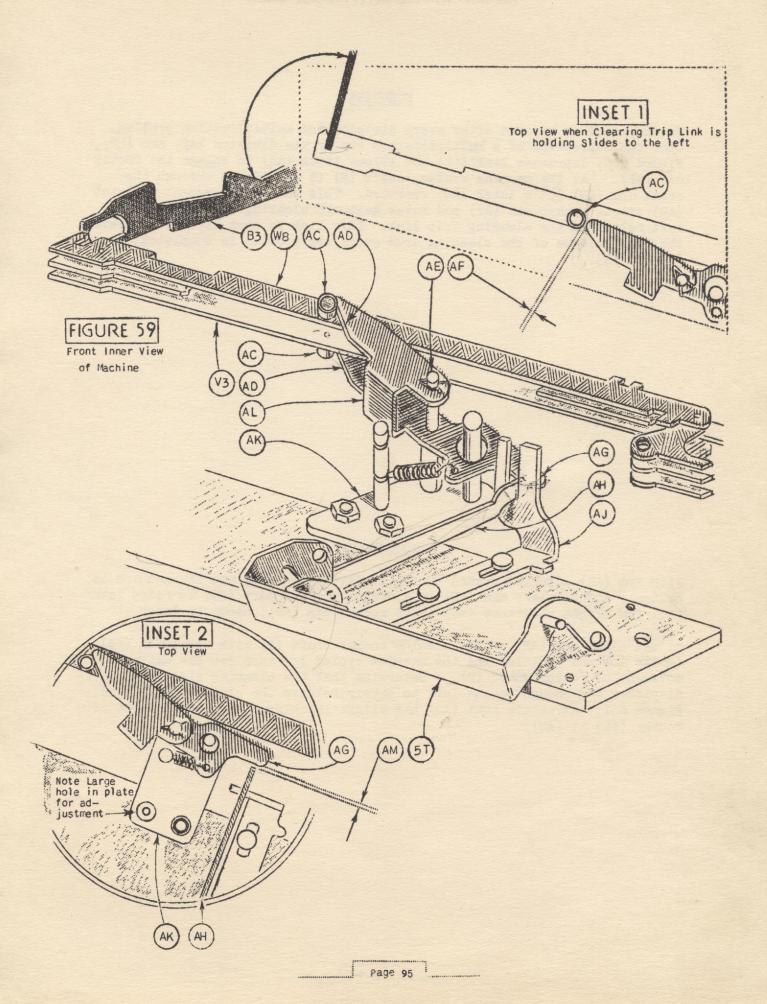
As the CX key is depressed, bail (5T), Figure #59, is rocked causing latch (AH) to move rearward contacting end (AG) of the clearing cam rocker (AL). As rocker (AL) pivots at (AE), its cam surfaces (AD) contact the rollers (AC) on the upper and lower dial clearing slides (W8) and (V3) forcing the slides to the left. This movement of the slides releases the clearing trip link (B3) and thereby causes the upper and lower dials to be cleared.

ADJUSTMENT

Adjust cam extensions (AD) by bending so that both surfaces contact rollers (AC) simultaneously.

Adjust plate (AK) so that rollers (AC) do not limit against the cam surfaces (AD) in neutral and slight clearance (AF) exists between the tip of cams (AD) and rollers (AC) with the slides (W8) and (V3) latched to the left, as shown in Inset #1. This plate (AK) must also be adjusted to give slight clearance (AM) between drop latch (AH) and (AG), shown in Inset #2.

Adjust guide bracket (AJ) forward or rearward so that (AH), through rocker (AL), will position slides (W8) and (V3) far enough to the left to safely unlatch trip link (B3) before (AH) cams upward to disengage (AG).

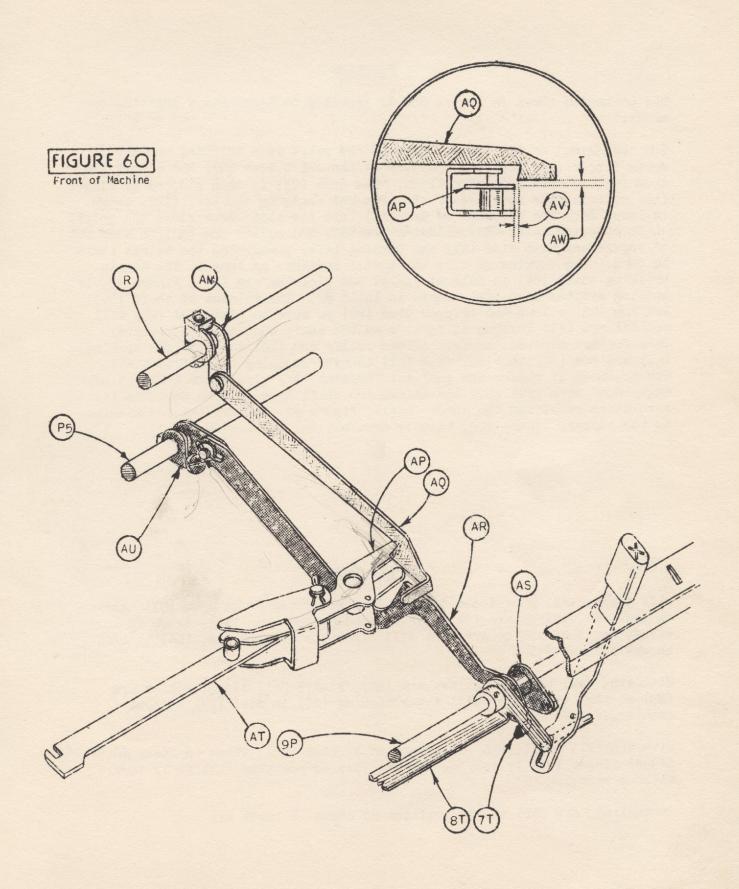


The keyboard is cleared after every division and multiplication problem. Upon the depression of a multiplication key or the division key, arm (AS), Figure #60, depresses link (AR) and allows latch (AQ) to engage the rocker cam (AP). As the machine cycles, shaft (R) is rocked and through the crank arm (AN) pulls latch (AQ) rearward. This rearward movement of latch (AQ) pivots rocker cam (AP) and moves keyboard clearing slide (AT) to the left releasing the clearing trip link. This link is then blocked to prevent the full release of the clearing drum until the problem is completed, Figures #15 and #33.

ADJUSTMENT

With arm (AS) adjusted upward to its limit, Figure #60, and the machine in neutral, adjust clamp arm (AU) on division rocker shaft (P5) to raise latch (AQ) for slight clearance (AW) above rocker cam (AP), shown in Inset.

Adjust clamp arm (AN) on the machine rocker shaft (R) with the latch (AQ) in its lowered position and the machine cycled 1/2 turn for the maximum movement of rocker shaft (R). Determine that the clearing slide (AT) is displaced far enough to the left to safely release the clearing trip link, Figure #51. Ascertain that (AQ) has slight latching clearance in front of rocker (AP) at (AV).



Page 97

The mechanism shown in Figure #61 is provided to terminate a shifting operation.

The "breaking" of the shift toggle at the start of a shifting operation moves finger (G4) from the aperture of the shift drum (G3.) and allows the drum (G3) to make 1/8 revolution. The drum (G3) is then stopped by finger (AZ) entering the aperture of the drum and engaging the pawl (H2), shown in Inset #4. The movement of arm (AZ) into the shift drum rocks the spiral shaft stopping latch (BA) allowing arm (BC) and roller arm (BD) to move out of engagement with stud (AX) and opening (AY), permitting the spiral shaft to turn. The turning of this shaft will continue as long as the toggle breaking shaft (C4) is held displaced and blocking arm (E3), Figure #8, is holding tripper disc (E4), shown in Inset #2. The release of shaft (C4) and arm (E3) allows the tripper disc (E4) to move so that stud (E8) will contact arm (F1) forcing it forward as the shaft continues to revolve. This forward movement of (F1) allows roller arm (BD) to enter the opening (AY) and arm (BC) to block stud (AX) thereby stopping the spiral shaft. The movement of roller arm (BD) into opening (AY) pivots arm (AZ) out of engagement with pawl (H2) and allows the shift drum (G3) to continue its revolution resetting the shift toggle, Figure #9, and driving the machine to the bumper, Figure #10, thereby neutralizing the clutch yoke.

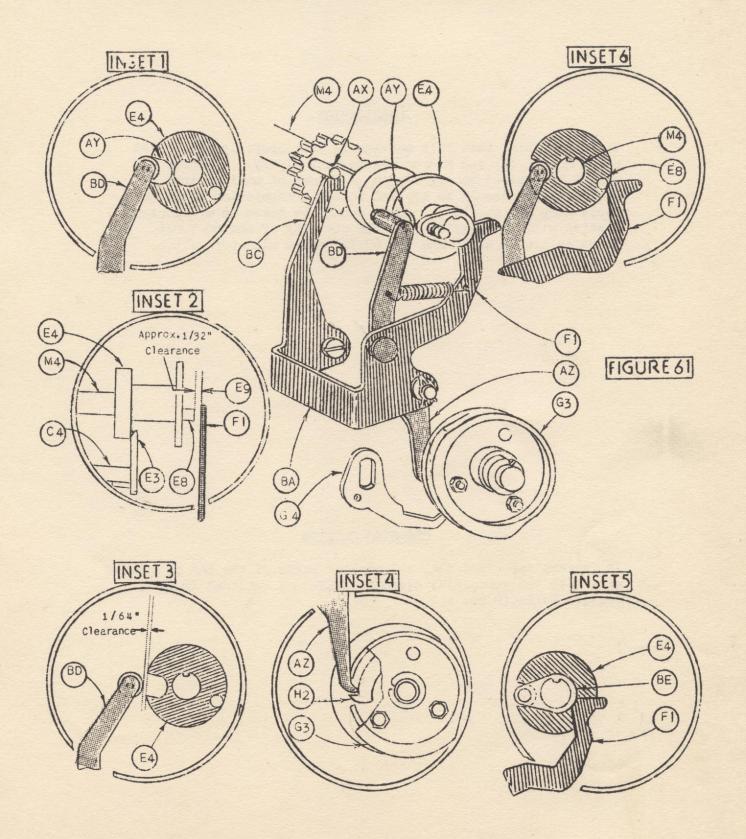
ADJUSTMENT

With finger (AZ) positioned in the aperture of the shift drum (G3), shown in Inset #4, adjust arm (F1) when limited against hub (BE), shown in Inset #5, so that roller arm (BD) will clear the tripper disc (E4) by 1/64", shown in Inset #3.

With stud (AX) blocked against arm (BC), Figure #61, adjust roller arm (BD) so that the roller will enter opening (AY) in disc (E4) without cramping.

With arm (Fl) positioned fully forward by stud (E8), shown in Inset #6, adjust finger (Fl) by bending bracket (BA) to position (Fl) fully inward without cramping.

In neutral, arm (BD) should position as shown in Inset #1.

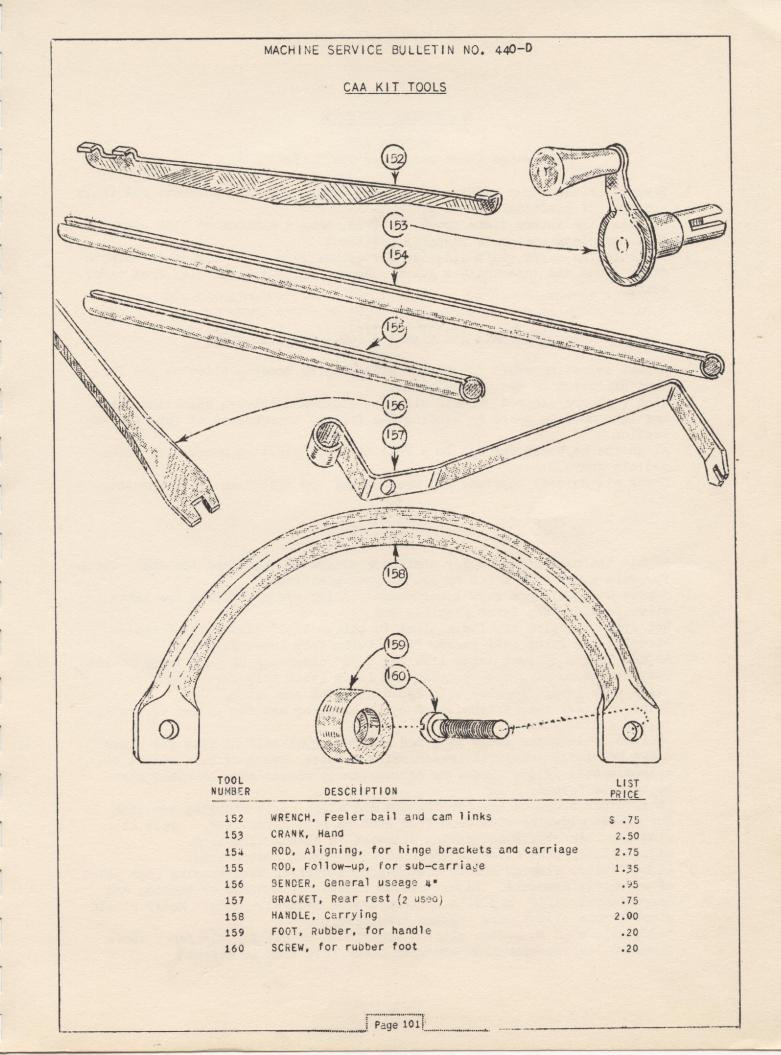


LUBRICATION

It is essential that this machine be kept properly lubricated using Monroe oil and Monroe grease exclusively. Monroe oil should be applied to all bearing surfaces of moving parts. Monroe grease should be applied to the transmission gears and cycle stop arm aperture. Care should be taken to avoid excessive oiling, especially in the vicinity of the $60-7002\frac{1}{2}$ friction clutch shaft and the 60-797 start and stop switch.

CLEANING CAUTION

It is very important that all plastic parts of the CAA be cleaned only with the commercial cleaner "DREFT" as outlined in Machine Service Bulletin No. 442.



ADJUSTMENT SEQUENCE

SECTION I

Wedge Shaft and Carry Shaft $(60-3000\frac{1}{2})$

- 1 Remove carriage from machine. Check the wedges for free movement and their springs for sufficient tension.
- 2 See that the intermediate gears are free, have a minimum of side play and that the check spring is properly tensioned.
- 3 Position the carry shaft sidewise for approximate 1/32" clearance between carry drums and intermediate gears. Remove excessive end play from carry shaft.

SECTION II

Selecting Shaft and Keyboard $(60-200\frac{1}{2}x1, 60-100\frac{1}{2})$

- 1 Adjust selecting shaft for slight side play by bending sidewise the forward extension of set-up cam plate.
- 2 With keyboard cleared, obtain sidewise clearance between selecting gears and intermediate gears by bending the forward protrusions of intermediate section.
- 3 Align the keyboard for 2/3 to a full hold of selecting gears with intermediate gears.
- 4 Check all numeral keystems for freedom and for restoring of one another.

SECTION III Plus and Minus Keys

- 1 Adjust the plus-minus rocker shaft for slight end play and the shaft latch for safe entry into notch in clutch yoke positioner.
- 2 Remove end play from rock lever shaft. Align cycle stopping arm latch sidewise with trip lever flexible end.
- 3 Set cycle stopping arm limit blank to obtain 1/32" clearance of cycle stopping arm latch over rocker lever (with trip lever downward).
- 4 Adjust length of rock lever link for 1/32" clearance of rock lever behind rear extension of cycle stopping arm latch (with trip lever raised). Align rock lever sidewise with cycle stopping arm latch.
- 5 Raise or lower rear extension of cycle stopping arm for proper neutralizing of clutch yoke.
- 6 Shorten or lengthen cycle stopping arm for equal hold of plus and minus claws of clutch yoke with transmission. Note: Depth of hold should be approximately 1/16". Under no circumstances should plus or minus claws be bent or peened.
- 7 Check cycle stopping arm for freedom and align cycle stopping arm link for slight sidewise clearance from stud on rock lever link. Cycle stopping arm link should not spring sidewise in either direction.
- 8 Adjust clutch yoke click to the neutral notch in clutch yoke.
- 9 Adjust switch closing arm to clutch yoke operating stud keeping high point of eccentric downward. Adjust switch blades for minimum of tension and approximately 1/32" gap with clutch yoke in neutral. Note: Motor should start before clutch yoke engages transmission.
- 10 Adjustable stud on switch closing arm should be set for clearance above clear-out switch operating arm when clear trip link is latched,

SECTION III (Cont'd)

11 Set the adjusting blank on the clutch yoke for a full throw of clutch yoke from the plus and minus keys.

12 Make sure that trip lever and trip rocker are absolutely free and set the trip lever flexible end for approximately 1/32" depth of hold with cycle stopping arm latch. Adjust the rear extension of the trip lever to the thru carry gear for approximately 1/32" lift of trip lever flexible end above cycle stopping arm latch. Trip lever should not limit on gear teeth.

13 Adjust bracket of machine stop lever for approximately 1/64" lift of trip

lever flexible end above cycle stopping arm latch.

14 Adjust forward off-set of quick stroke latch for a simultaneous latching of this latch and trip lever; also adjust for excess opening between sub-lever and machine stopping lever after its flexible end moves from under the trip lever lug.

15 The rear off-set on the quick stroke latch should be bent to position against cycle stopping arm when machine stopping lever is latched.

16 Adjust limit blank for scissor locator toggle to hold forward roller of toggle with very slight clearance from high point of cam when locator toggle is made.

17 Adjust eccentric stud on rear extension of locator toggle to hold the toggle forward against its limit blank and to also hold the shift keys to

their upward limit.

18 Adjust the locator toggle breaking arm on its pivot shaft to remove end play from the shaft and to "break" the toggle when the cycle stopping arm is approximately 1/32" from the bumper pad.

19 Adjust locator cam on R.H. end of jack shaft for equal movement from center

position during plus and minus bumper strokes.

SECTION IV Shift Mechanism

- l Close up prongs of shift operating lever guide bracket to remove excessive side play of shift lever and form the rear extension of lever to hold shift trip pawl down to limit against rocker shaft when front extension holds shift keys up to their limit. Shift operating lever should hold shift trip pawl with only slight side play at its lower end. Free shift keys and shift operating lever so that shift keys drop of their own weight with lever held down at front end.
- 2 Adjust shift control shaft sidewise for approximately 1/32" clearance between rocker shaft arm and the arm on left-hand end of shift control shaft.
- 3 Adjust shift trip lever to hold shift trip pawl with slight side play and to hold arm on left-hand end of control shaft approximately 1/32" below rim of tripper disc when shift trip lever is limiting against rocker shaft.

4 Set shift toggle tripping blank for 1/64" clearance behind toggle off-set.

5 Adjust friction shaft to have slight end play.

- 6 Adjust shift toggle clamp sidewise for full re-setting of toggle from shift drum. Toggle must be absolutely free with its spring disconnected.
- 7 The adjustable bracket for the friction housing roller arm should be set sidewise on cross brace to obtain approximately 1/64" clearance of shift drum clutch arm from pawl in drum when shift toggle is fully broken."
- 8 Set machine friction adjusting nuts to obtain approximately 1/16" gap between machine friction spring arm and bracket with shift toggle fully made.

SECTION IV (Cont'd)

- 9 With shift drum neutral, bend upper L.H. extension of shift worm stopping latch forward or rearward so that approximately 1/2 of roller on latch protrudes behind rim of tripper disc.
- 10 With shift drum at 1/8 turn, bend forward extension of worm stopping latch for 1/64" clearance of roller arm behind tripper disc.
- ll Form flat stock at rear of stopping latch for full forward movement of its upper right-hand extension when latch is held forward by stud on tripper disc.
- 12 Raise or lower upper right hand extension of worm stopping latch to provide free entry of roller into cut of tripper disc when rotating worm shaft fully in either direction with shift drum at 1/8 turn.
- 13 With tripper disc held to right by arm on L.H. end of shift control shaft, bend forward extension of stopping latch sidewise for 1/32" sidewise clearance from stud on tripper disc. With toggle made, bend tripper disc restoring arm to provide same condition.
- 14 With shift drum at half way position, turn eccentric stud in restoring roller arm for safe but not full downward movement of division shaft resetting cam. In same drum position, adjust downward extension of cycle stopping arm link for full movement of cycle stopping arm to bumper.
- 15 Remove all end play from worm shaft.

SECTION V Carriage Contents & Setting

- l Remove sub-carriage. See that upper and lower dials and intermediate gears are free and do not have excessive side play. Check pawls must be free.
- 2 Straighten and align carriage.
- 3 Check dial clear shafts and linkages for free movement.
- 4 Check counting fingers for freedom and springs for sufficient tension.
- 5 Align hinge rod brackets and clearing arms with aligning rod and install carriage on machine. Back out adjusting screws in carriage end plates.
- 6 Adjust carriage for proper forward, rearward and sidewise mesh of lower dial intermediate gears with machine intermediate gears.
- 7 Loosen carriage raising arm clamps and back out set screws to drop carriage fully into mesh, then adjust set screws to raise carriage 1/2 turn of screw above full depth of mesh.
- 8 Take out play (downward) in carriage raising arms and retighten clamps.
- 9 Run thru tests for proper calculation using plus and minus bars.

Carry Counting & Change Lever $(60-8000\frac{1}{2}x1)$

- 1 Align carry counting cam shaft for equal sidewise hold of either driving cam with fork on carry counting assembly.
- 2 Bend counting finger assembly fork for equal displacement of upper dial gears by first counting finger. Fork should have only slight play on cams.

SECTION VI (Cont'd)

3 Bend left-hand extension of counting finger assembly to give equal displacement of upper dials in both directions by left-hand carry finger.

4 Bend forward off-set of change lever link latch up or down for safe clearance of step on link to move over off-set of latch as change lever is moved manually.

5 Rear off-set on change control lever should be bent up or down to prevent movement of change lever by clamp arm during division when change control lever is forward.

SECTION VII Dial Clearout

- 1 Set clear keys level with C.P. Set-Up key, and make sure that clear slides are absolutely free.
- 2 Remove end play from carriage raising shaft and clearing shaft, and check for sidewise clearance of carriage raising roller arm from clear drum drive gear.
- 3 With clearout slides to the right and clear trip link in forward position, check for approximately 1/32" sidewise movement of slides.
- 4 Bend upward extension of clear trip link latch to lay evenly against lefthand end of all clear slides, and bend forward extension of latch to release trip link approximately 1/16" before clear keys bottom. Bend forward extensions of latch upward to obtain full depth of hold with trip link.
- 5 Bend dial clearing arms for approximately 1/16" sidewise clearance from study on clearing couplers.
- 6 With all clearing slides to left and clear drum at halfway position, adjust arm on left-hand end of clearing shaft to fully re-set zero keys without cramping.
- 7 Adjust upper and lower dial clear clamps to fully clear dials with slight after pressure. Caution: In setting clamps, care should be taken to see that sidewise position of clamps does not limit full movement of slides to right and left.
- 8 Driving arm for power link should be set-screwed to R.H. end of clearing shaft so that it does not interfere with full sidewise movement of keyboard clearing slide.
- 9 If necessary, bend restoring tails of clamps sidewise to align with clearing arms. Bend tails up or down to restore clearing arms to point where dial clear locking shafts may be moved freely sidewise. Bend clearing arm limit blanks to hold clearing arms up against restoring tails on clamps with clear shaft neutral.
- 10 Clear trip link must be absolutely free all the way forward and rearward.
- 11 With trip link held in blocked multiplication position, adjust rock lever to just clear under operating stud on clutch yoke.
- 12 Shorten or lengthen lock lever by bending at its off-set forming to provide safe blocking of lever by clutch yoke operating stud with clutch yoke in plus or minus. Bend lock lever sidewise for safe sidewise clearance from clutch yoke click and switch closing arm.
- 13 Adjust clear clutch arm on lock lever shaft to safely re-set clear trip link behind the longer of two latches when upper extension of clutch arm is on pin in clear drum.

SECTION VII (Cont'd)

14 In blocked multiplication position, adjust eccentric screw at rear end of off center blocking lock to hold clear trip link blocked in same position as it is held by multiplication clear blocking lever.

15 Adjust eccentric hub for machine toggle latch so that latch does not cramp against stud on toggle breaker assembly when stud on clear drum is under clear clutch arm and so that latch will not block toggle when trip link is in blocked multiplication position.

16 Adjust carriage raising roller arm to move fully up into cut in clear drum, and see that spring arm on right-hand end of shaft clears below

shift lever by approximately 1/4".

17 Adjust eccentric stud at rear of carriage raising roller arm to hold roller on carriage shift raising arm all the way up into cut in shift drum cam.

SECTION VIII Set-Up

1 Make sure that set-up toggle is absolutely free and that its spring at front end has sufficient tension to fully set N.R. key. Bend rearward extension of toggle arm forward so that its stud does not limit full forward movement of sub-carriage positioner disabler slide.

2 Rear extension of lower toggle arm should be bent inward to hold gear

60-7752 with slight side play.

- 3 With set-up toggle broken, adjust limit plate to hold minus throwing arm with very slight clearance behind roller arm of set-up yoke positioner. Caution: Too much clearance at this point will result in limiting of minus throwing arm from moving far enough forward for full rearward movement of yoke throwing lever in minus.
- 4 Bend forward lug of yoke throwing lever for full movement of clutch yoke in plus (do not bend more than necessary).
- 5 On plus bumper stroke, check to see that stud on rear of set-up toggle arm does not cramp full movement of set-up cam.
- 6 After plus bumper stroke, check to see that rear lug on yoke throwing lever is formed to fully move clutch yoke fully into minus.

7 Bend rear extension of lower set-up toggle arm for full restoring of

set-up toggle on minus cycle.

- 8 If stud on gear tends to jam against point of toggle resetting blank during minus set-up cycle, bend forward extension of toggle arm upward to limit sooner against stud on repeat key. This will lower rear tip of toggle re-setting blank.
- 9 Form yoke throwing lever latch for safe latching and releasing of lever.
- 10 Check sub-carriage for freedom of multiplication dials, constant gears and storage gears. Check feeler fingers for freedom and alignment across front edge of their forward extensions.
- 11 Check sub-carriage hinge rod for straightness and assemble sub-carriage to carriage.
- 12 Sub-carriage hinge rod must turn freely and hold sub-carriage so that teeth of storage gears cannot trip on lower dial intermediate gears as sub-carriage is moved sideways. Sub-carriage should be held forward for safe clearance of lower dial intermediate gears from flanges on storage gears.

£	*********	14.	
 P	age	106	1

(SECTION VIII (Cont'd)

Remove excessive sidewise play from sub-carriage shift lever and position shift lever sidewise by use of shims to hold storage gears with approximately 1/64" sidewise clearance from lower dial intermediate gears with transfer lever latched and sidewise play in sub-carriage taken out to the left.

14 Form constant comb latch so that it cannot ride over or under right-hand extension of comb, and check for safe sidewise clearance of latch from

comb with sub-carriage in first position.

15 Adjust guide at left-hand end of constant comb for parellel movement of comb and bend upper left-hand extension of constant lever for full hold of comb teeth with constant gears. Note: Slot in L.H. end of constant comb may be cut deeper to obtain more movement of comb to left.

16 Bend right-hand extension of comb forward or rearward for clearance behind

comb latch.

17 Form transfer slide so that its lower edge lays against carriage and its right-hand upright so that lug on sub-carriage connot ride under it on a transfer operation.

18 Form sub-carriage driving cam so that its left hand edge lines with left-

hand edge of holding cam on right hand end of selecting shaft.

19 Install carriage on machine and set headed adjusting screw in right-hand carriage end plate to prevent leftward drift of carriage during multipli-

cation set-up.

20 Lower extension of R.H. end plate in sub-carriage should be bent to left to give sufficient movement of sub-carriage to the right for safe relatching of transfer lever on a transfer operation. Note: Control for return of sub-carriage on transfer is the limiting of forward extension on sub-carriage positioner against screw in side frame.

21 With carriage in first position, adjust unheaded screw in right-hand carriage plate to hold sub-carriage fully to the right for safe latching of transfer lever. Caution: Do not set the screw in to point where it pre-

vents full return of disabler slide after multiplication set-up.

22 Headed adjusting screw in left-hand carriage plate should be set to move flexible end of shift control bar under shift disabler. Note: Do not

adjust screw to move shift control bar fully to the right.

23 Adjust keyboard clearing kicker disabler sidewise to hold kicker in line with left-hand edge of rear extension on trip bell crank. Form disabler to lay up against bracket and to safely engage carriage lug and with safe clearance from transfer slide. Make sure that disabler and kicker move freely sidewise.

24 Form keyboard clearing and trip bell cranks so that kicker will properly engage keyboard bell crank in its lowered position; also to clear over keyboard bell crank and safely engage trip bell crank in its raised posi-

tion during multiplication set-up.

25 With carriage in first position, bend top of kicker forward or rearward for release of all keys at end of forward movement of kicker. On a hand multiplication set-up operation of machine, make sure that kicker moves down freely to engage keyboard clearing bell crank during minus cycle.

26 Move forward extension of trip rocker up or down to obtain 1/64" lift of trip lever above cycle stopping arm latch during plus and minus set-up

cycles with carriage in first position.

SECTION VIII (Cont'd)

- 27 With carriage out of first position and N.R. key down, adjust keyboard lock (clamped to rock lever shaft) for approximately 1/64" clearance of lock under locking bail when kicker has its maximum forward movement.
- 28 Install shim washer behind driving stud for sub-carriage, if necessary, to obtain at least 2/3 sidewise mesh of storage gears with lower dial intermediate gears on a multiplication set-up.
- 29 Constant comb positioning fingers should be set on left-hand end of subcarriage rod for approximately 1/64" clearance of rear finger behind left-hand extension of comb with carriage fully seated and constant lever neutral.

SECTION IX C.P. Set-Up

- 1 Form left-hand downward extension of operating arm for return lever quick stroke latch to lay flush against all three clear slide bell cranks. Form right-hand off set of operating arm to hold upward extension of quick stroke latch approximately 1/64" away from off-set lug on carriage return lever (clear slides neutral).
- 2 Bend forward extension of locator toggle breaker forward or rearward to enter approximately halfway in narrow part of cut at rear of shift reversing swivel.
- 3 Check to see that index plate moves freely and that its toggle spring has sufficient tension to hold plate fully positioned forward and rearward.
- 4 Run clear drum halfway through a dial clearing cycle, raise return lever to its latched position and form off set on return lever lug to have a good latching angle with quick stroke latch and to hold rear end of return lever above right-hand extension of shift reversing swivel with approximately 1/64" clearance.
- 5 Leaving clear drum and return lever as above, move index plate rearward, and check to see that hub of shift reversing rocker limits against side frame and that rocker has a full sidewise hold on stud of upper shift key; then move index plate forward and check for free movement of rocker to the right and a full sidewise hold of rocker over lower shift key stud. To secure above conditions, it may be necessary to form power link to prevent its cramping rocker and to bend forward extension of shift rocker sidewise.
- 6 Bend forward extension of C.P. Set-Up lever to allow cut at rear extension of return lever to rest fully down on swivel and off-set lug of C.P. Set-Up lever. Move return lever forward or rearward to obtain sidewise clearance of rocker from either shift key stud. Note: Slight bending of rocker sidewise may be necessary to obtain this condition.
- 7 With clear drum neutral, raise return lever and bend forward extension of toggle breaker sidewise for clearance of rocker from either shift key stud (index plate forward and rearward). At the same time, bend rearward extension of shift disabler up or down for safe latching under and over flexible end of shift control bar.
- 8 Under power (index plate in both positions) check for full pull-down of shift keys on C.P. Set-Up and clear operation. Also check to see that right-hand extension of yoke throwing lever is safely blocked by end of carriage return lever when carriage return lever is held up by swivel.

*****************************	************	
Page	108	

SECTION X Division

- 1 Remove excessive end play from division rocker shaft and position shaft for sidewise alignment of its roller arm with clutch yoke click.
- 2 Check clearance between division restoring roller and clutch yoke click eccentric. Bend roller arm rearward for clearance.
- 3 Set shift control latch disabler to top of slot in division shaft roller arm.
- 4 Form division tripping link for freedom and clearance from transmission.
- 5 Trip division shaft and check for full free movement of division shaft (division re-setting cam held to limit against clutch yoke click stud) and adjust index plates setting arm for full movement of index plate forward.
- 6 Set butterfly positioning link all the way forward with slight clearance from butterfly shaft.
- 7 With machine toggle fully made, adjust yoke throwing links (through bending at formings) to hold links so that the ends of their slots move up to butterfly shaft and switch closing arm stud without cramping. Caution: Unless these links are absolutely free, it will be almost impossible to have plus-minus control blanks operate properly.
- 8 Temporarily set eccentric butterfly stud down and halfway to the rear and make sure that control blanks are absolutely free.
- 9 Turn eccentric stud on butterfly positioning link down and to the rear to point where latch on outer control blank just clears over stud during minus fire of clutch yoke (inner yoke throwing blank forward).
- 10 If necessary, move butterfly positioning link rearward to obtain safe unlatching clearance of outer control blank latch from positioning link eccentric stud when outer link moves forward for plus fire of clutch yoke. Caution: Do not move so far rearward that depth of hold of control blank latch on eccentric stud becomes critical.
- ll Bend upper extension at forward end of butterfly positioning link forward or rearward to break machine toggle just before division shaft limits in its forward movement.
- 12 Bend off-set lug on division roller arm to hold clearing lock lever with 1/64" clearance from clutch yoke operating stud.
- 13 Adjust toggle tripping pawl to break machine toggle when cycle stopping arm is approximately 1/32 from bumper pad. Adjust tripping pawl guide bracket up or down for good hold of step in pawl with off-set on upper extension of machine toggle. Upper extension of toggle should be bent in for safe sidewise hold of its off-set with toggle tripping pawl.
- 14 Bend limit lug on shift trip link guide bracket to hold rocker at rear end of link up to arm on left-hand end of shift control shaft. Form trip link for safe sidewise clearance from minus arm of clutch yoke.
- 15 Bend off-set on shift trip link rearward so that shift toggle "breaks" simultaneously with "breaking" of machine toggle.
- 16 Bend rear extension of shift control latch up or down so that its forward step just clears over off-set on shift trip link on minus bumper stroke.
- 17 Adjust length of toggle, re-setting link and its downward extension to fully make machine toggle from rocker lever and worm shaft.
- 18 With division and multiplication shafts neutral, bend forward extension of toggle tripping pawl up or down to obtain approximately 1/64" clearance over off-set on machine toggle.

***************************************	************	",
Page	109	

SECTION X (Cont'd)

- 19 Adjust change lever positioning arm (clamped to right-hand end of division shaft) to provide slight clearance of step in positioning link behind stud in positioning arm. Positioning arm should also be set for safe sidewise clearance from repeat setting link and shift lever.
- 20 Adjust eccentric collar on division key restoring rocker for full re-setting of division key without cramping.
- 21 With division shaft tripped and shift drum at 1/8 turn, check to see that there is slight clearance for passage of re-setting blank under eccentric stud on restoring roller arm.

SECTION XI Multiplication (Three Keys)

- l Remove carriage. Set minus multiplication arm to hold "-X" key fully upward against plate, also to hold "-X" key aligned straight (multiplication shaft to the right with slight clearance between its right-hand end and change control lever).
- 2 Adjust multiplication shaft hold-down arm to raise approximately 1/16" above sub-plate latch when "-X" key is fully depressed and to align sidewise with downward extension of trip rocker and sub-plate latch. Form trip rocker to lay in toward side frame.
- 3 Adjust trip rocker by bending its downward extension forward or rearward so that elongated slot of trip rocker does not cramp rearward against its guide and pivot screw when multiplication shaft is in neutral.
- 4 Adjust rear extension of trip rocker for safe entry of its stud into narrow aperture of trip lever with multiplication shaft neutral and safe divorcing action from narrow aperture with multiplication shaft latched.

 Note: After making above adjustment, it will be necessary to raise or lower front end of rocker for proper tripping action on multiplication set-up operation.
- 5 Adjust guide bracket for multiplication trip latch to hold latch with approximately 1/64" clearance in front of off-set on trip rocker with multiplication shaft neutral. Make sure that bracket does not cramp upward movement of latch.
- 6 Adjust arm on left-hand end of multiplication shaft to break machine toggle after multiplication shaft is latched and before "-X" is fully depressed.
- 7 Adjust control arm for clear blocking lever to hold forward extension of lever with safe latching clearance above its hold-up latch. Note: The sidewise position of arms mentioned in parts 6 and 7 controls the sidewise position and amount of end play in multiplication shaft.
- 8 Adjust keyboard clear control arm assembly on multiplication shaft to hold "X" key and universal bail up to their limit and aligned properly sidewise.
- 9 Form multiplication universal bail to bring both hold-down arms even at their rear extensions and to hold plus-minus control blanks safely in their plus position when universal bail is latched.
- 10 Bend lug on C.X. bail so that depression of "CX" key will rotate multiplication shaft the same distance as caused by full depression of "-X" key.

SECTION XI (Cont'd)

- 11 Bend forward extension of carriage return lever to lay up against stud in CX bail.
- 12 Adjust plus and minus lock slide for slight clearance of roller on multiplication counting finger raising arm behind step in lock slide. Keep lock slide straight in its guide slot and check for safe latching of upward extension on slide when carriage is out of first position.
- 13 With multiplication shaft neutral and N.R. down, adjust repeat setting blank on slide rearward to lay against lug on repeat-non-repeat swivel.
- 14 Bring feeler bail and cam into alignment at high point of their rear surfaces by bending left-hand extension of cam forward or rearward. Install carriage on machine for following adjustments.
- 15 With multiplier dials at zero (feeler bail and cam fully rearward) adjust feeler bail linkage to hold sub-plate latch with approximately 1/64" clearance behind hold-down arms.
- Adjust feeler cam linkage to raise multiplication trip latch for approximately 1/64" clearance above off-set at front end of trip rocker with feeler cam held by forward positioned feeler finger and also to raise trip lever at least 1/64" above cycle stopping arm latch as feeler cam moves rearward. Note: Check in all carriage positions and make any necessary compensating adjustment to feeler cam link as may be necessitated by variations in feeler cam movement in any carriage position.
- 17 Check sidewise alignment of shift feeler arm with rear extension of butterfly and close guide blanks to hold shift feeler arm with slight side play.
- 18 Adjust butterfly clamp to rotate butterfly for safe clearance of shift feeler arm under rear extension of butterfly when feeler cam is held forward by feeler fingers. Caution: Do not set butterfly to point where it is prevented from limiting against sub-plate stud as feeler cam moves rearward.
- 19 Eccentric stud on butterfly should be set to hold plus-minus control blanks in their plus position with feeler cam fully rearward and to move control blanks to their minus position when feeler cam is moved forward by feeler fingers.
- 20 With multiplier dials at zero (feeler cam fully rearward) and carriage in shift raised position, adjust stud in elongated slot of carriage raising arm to hold feeler cam linkage bell crank with slight play between stud on feeler cam linkage and adjustable stud on raising arm.
- 21 In multiplication shift (hook holding square stud at front of shift trip link) bend right-hand off-set on machine toggle breaker assembly to obtain slight clearance of off-set under lower extension of hook.
- 22 Bend lower extension of shift feeler arm forward (if necessary) to obtain sufficient forward movement of shift trip link for safe clearance of step on hook behind square stud on link.
- 23 Bend rear extension of hook down to obtain safe depth of hold of hook on square stud. Caution: Before bending hook, make sure that butterfly is fully neutralized (resting against sub-plate stud).
- 24 Close guide lugs on intermediate section to hold multiplication counting finger in correct sidewise alignment with storage gears. Guides should hold finger with only slight play and finger should be absolutely free.

-		*********	
	Page	111	

SECTION XI (Cont'd)

25 Bend upward extension of multiplication counting finger operating arm forward or rearward for full displacement of storage gears and multiplier dials. Note: Forward extension of multiplication counting finger raising roller arm may be bent downward to increase spring tension for raising of counting finger.

26 Bend upward extension of guide bracket for multiplication counting finger link to hold counting finger fully down to collar on intermediate gear shaft when machine is on center. Caution: Excessive forward bending of this bracket may cause failure of counting finger to occasionally count

out storage gear properly.

27 Raise or lower carriage positioning latch so that its downward extension has only slight clearance to latch over forward extension of feeler bail when feeler bail or feeler cam are held forward by any feeler finger. All up and down play should be removed from latch.

28 Bend carriage positioning latch to clear in front of forward extension of feeler bail by approximately 1/64" when latch is held forward by transfer

slide.

29 With carriage in first position and transfer slide to the right, form right-hand lower edge of transfer slide in toward carriage, and if necessary, remove stock from lower edge of slide to permit sufficient rearward movement of carriage positioning latch.

SECTION XII Automatic Dial & Keyboard Clear

1 Align the three clearing cams at their left-hand extensions.

2 Adjust clearing cam bracket sidewise to obtain a very slight clearance between left-hand end of cams and rollers on clearing slides with slides held to left by clear trip link. Also, adjust bracket forward or rearward for approximately 1/64" clearance between rear end of dial clearing pawl and right-hand extension of dial clearing cam. Caution: After making this adjustment, check to see that clearing cams do not limit full movement of clearing slides to the right.

3 Guide and camming bracket for dial clearing pawl should be set to raise pawl above right-hand extension of dial clearing cam immediately after re-

lease of clear trip link during depression of "CX" key.

4 Adjust keyboard clearing pawl control link on division shaft to hold pawl with slight clearance above right-hand extension of keyboard clearing cam when division shaft and multiplication shaft are neutral.

5 With division shaft tripped, hand cycle machine and adjust keyboard clearing pawl on rock lever shaft for safe release of clear trip link latch.

SECTION XIII Locks

l Adjust guide bracket for "-X" and "-" key arms sidewise so that right-hand extension of bracket lays against "-X" arm without cramping it; then set "-" arm sidewise to lay against left-hand extension of guide bracket.

2 Move cross lock forward or rearward for a slight clearance of its forward

edge behind "-X" key arm.

3 Set plus-minus shaft locking finger to center in cut at rear of cross lock with plus-minus shaft neutral, and also for locking finger to clear to left of cross lock by approximately 1/32" with division key restored.

Page	112	

SECTION XIII (Cont'd)

4 Adjust locking blank on right-hand end of plus-minus rocker shaft for cut in its front edge to center with off-set lug on rear of plus-minus lock slide.

5 Adjust stud in elongated slot of C.P. Set-Up key slide lock for very slight clearance from lower extension of set-up lock with set-up toggle

fully broken.

6 Bend left hand extension of C.P. Set-Up key slide lock forward or rearward so that full depression of any multiplication key will move slide lock rearward to point where its adjustable stud limits against lower extension of set-up lock.

7 Adjust right-hand extension of cross lock for full rearward movement of

C.P. Set-Up lock when division key is depressed.

SECTION XIV Tabulator Keys

1 Form lower ends of tabulator keys to conform to end carriage position tabulator stops.

2 Set plunger in shift trip pawl for approximately 1/32" clearance under

end position tabulator stops.

3 Bend top of shift trip pawl to bring rear surface at top of plunger ap-

proximately in line with rearmost extension tabulator stops.

4 Check to see that shift trip pawl is moved rearward far enough by any tabulator stop for safe but not excessive release of shift control shaft. Bend top of shift trip pawl forward or rearward if needed for majority of stops and bend tabs for adjustment of individual positions. Caution: Excessive forward bending of the shift trip pawl may result in (1) jamning of plunger against a depressed tab, (2) with #2 and #9 tabs depressed, failure of the carriage to stop between extreme end positions and the 2nd and 9th positions.

of It may be necessary to bend lower extensions of tabulator stops upward to prevent camming of shift trip pawl rearward when plunger in trip pawl is moved upward against lower edge of tabulator stops during depression of shift keys. Caution: Excessive upward bending of tabs may result in failure of carriage to stop between extreme end positions and second and ninth positions when #2 and #9 tabs are depressed as above.

CAA Operating Tests

The following eight operating tests are recommended to determine that machines are functioning satisfactorily.

TEST "A"

```
All 9's x all 9's = 999,999,999,800,000,000,01
    8's x
               8's = 790, 123, 456, 632, 098, 765, 44
     7's x
               7's = 604,938,271,483,950,617,29
    6's x
               6's = 444,444,444,355,555,555,56
    5's x
               5's = 308,641,975,246,913,580,25
    4's x
              4's = 197,530,864,158,024,691,36
    3's x
            11
               3's = 111,111,111,088,888,888,89
    2's x
               2's = 493,827,160,395,061,728,4
    l's x
               1's = 123,456,790,098,765,432,1
All 9's x all 1's = 111,111,111,088,888,888,89
    8's x
               2's = 197,530,864,158,024,691,36
    7's x
               3's = 259,259,259,207,407,407,41
    6's x
               4's = 296,296,296,237,037,037,04
    5's x
              5's = 308,641,975,246,913,580,25
               6's = 296, 296, 296, 237, 037, 037, 04
    4's x
 11
    3's x
               7's = 259,259,259,207,407,407,41
    2's x
               8's = 197,530,864,158,024,691,36
    l's x
              9's = 111,111,111,088,888,888,89
    9's x
               2's = 222,222,222,177,777,777,78
                                                    (3 times)
All 9's \div 1234567899 = 810,000,001,3
    8 ts "
                       = 720,000,001,2
 11
    7'5 "
                       = 630,000,001,0
    6's "
                       = 540,000,000,9
    5's "
               11
                      = 450,000,000,7
 11
    4's "
                      = 360,000,000,6
 11
    3's "
               11
                      = 270,000,000,4
 11
    2'5 "
                      = 180,000,000,3
    1's "
                         90,000,000,1
All 1's \div 9987654321 = 111,248,454
 11
    2'5 "
               11
                      = 222,496,909
 11
    3's "
               11
                      = 333,745,364
    4's "
               11
                      = 444,993,819
    5's "
               11
                      = 556,242,274
    6's "
                      = 667,490,729
 11
    7'5 "
                      = 778.739.184
    8'5 "
                      = 889,987,638
    9'5 "
                      = 1,001,236,093
```

TEST "B"

- 1. Set tabs 2 4 6 8 simultaneously.
 - (a) By successive depressions of the lower carriage shift bar move carriage to 10th position.
 - (b) By successive depression of the upper carriage shift bar move carriage to 1st position.
- 2. Clear tabs. Set tabs 3 5 7 9 simultaneously.
 - (a) Repeat 1 (a)
 - (b) Repeat 1 (b)

TEST "C"

DECIMAL SET-UP

Upper Dials 7 - 0
Keyboard 7 - 0 Upper and Lower Dials Locked
Lower Dials 14 - 7 - 0

										depress	
11	11	11	11	11	.11	11	11	11	11	H.	CX
11	36	11	11	11	11	133	5 11	11	11	11	
11	11	11	11	II .	11	11	11	11	11	11.	CX
11	34	11	11	11	11	174	. "	11	11	11	SU
11	11	11	11	11.	11	11	11	11	11	11	CX

Upper Dials read: 110.0000394.

Lower Dials read: 004052.0028368.0055534.

Unlock Dials Clear Machine

TEST "D"

DECIMAL SET-UP Upper Dials 4
Keyboard 4 Transfer at 4
Lower Dials 8

- Step 1 Set 12.34 on keyboard. SU. Set 12.34 on keyboard X key. Transfer lock C. S.U. dials now read 152.2756.
- Step 2 Set 12.34 on keyboard. CX key. Set 12.34 on keyboard X key. Upper and lower are all zeros. Shift carriage to left.
- Step 3 Lock 12.34 on keyboard. Set tab at 5 and 6. Depress CX key. Clear upper dials, depress divide key. Upper dials and S.U. dials both read 152.2756. Lower dials all zeros.
- Step 4 Depress CP Upper and Lower. Set 10 on keyboard, depress divide key. Depress divide stop key when 2nd decimal place is reached. Upper dials read 1.23, Lower dials .04. Shift carriage to left. Clear upper and lower dials.
- Step 5 Set 12.34 on keyboard X- key. Remove tabs. Shift carriage to left. Unlock C. Set 12.34 on keyboard. Depress X key. Upper and SU dials read all zeros. Lower dials 1 in 14th place.

TEST "E"

SET-UP DIAL TEST

Clear Machine

- Step 1 Set 1234567899 on keyboard SU Lock C Set 1 on keyboard CX key " " " " " " Unlock C " " " " " Unlock C
- Step 2 Set on keyboard 8753197532. Depress SU. SU dials now read 9987654321. Set 1 on keyboard, Depress CX key.
- Step 3 Set on keyboard 2357913578. Depress SU. SU dials now read 1234567899.
- Step 4 Set all 5's on keyboard. Depress SU. Lock C. Set all 9's on keyboard. Depress CP. Check SU dials.

TEST "F"

DECIMAL SET-UP	Upper Dials	4 - 2	Change Lever @	X
	Keyboard _	2	Tab Stop	5
	Lower Dials	6	Change control	Lock Up

- Step 1 Set 15650.50 on keyboard and hold lower carriage shift bar until carriage stops. Depress Plus bar once. Clear upper dials.
- Step 2 Set 11616.42 on keyboard. Depress division key. Copy result 34.7 from right side of 4th place in upper dials.
- Step 3 Set 18420.40 on keyboard. CP set-up upper and lower. Set 14312.30 on keyboard. Depress division key. Copy result 28.7 from upper dials.

* * * * * * * * * * * * * * * *

DECIMAL	SET-UP	Upper Dials	4	- 2	Change Lever @	X
		Keyboard		2	Tab Stop	5
		Lower Dials		6	Change Control	Lock Down

- Step 1 Set 11616.42 on keyboard. CP set-up upper and lower. Set 15650.50 on keyboard. Depress division key. Copy result 25.8 from right side 4th place in upper dials.
- Step 2 Set 14312.30 on keyboard. CP set-up upper and lower. Set 18420.40 on keyboard. Depress division key. Copy result 22.3.
- NOTE: In both Increase and Decrease Per Cent calculations, the dividend is always This Year or Period Amount, and the divisor is always Last Year or Period Amount. The change lever is always at X for both. The change control lock is always UP for Increase and DOWN for Decreases. The upper dials to the left of the 5th decimal will always show 9's for Decreases and zeros for Increases. If the 5th dial contains a "2" in increases, it means that the per cent is over 100%, or if it contains a "3", it is over 200%, etc. A decrease cannot be over 100%.

Excerpt of Accounting Service Bulletin No. 511 "Per Cent of Increase and Decrease".

TEST "G"

- DECIMAL SET-UP Upper Dials 4 Change Lever @ ÷
 Keyboard 8-4-0 Change Control Lock Down
 Lower Dials 4 Lock Lower Dials
 Tab Stop 5 Lock Upper Dials
 Transfer Slide 4
- Step 1 Set 1 in 1st column of keyboard. Depress set-up key. Pull down constant multiplier lever.
- Step 2 With individual zero keys, lock 8952 on extreme right of keyboard. Set 1226. (Dept. A) on keyboard at 4th decimal marker. Depress CX key. Depress division key. Write answer 13.69 while machine is dividing.
- Step 3 Set 1697 (Dept. B) on keyboard at 4th place. Depress CX key. Depress division key. Write answer 18.96.
- Step 4 Continue same routine for Departments C and D. Upon completion, upper dials show 40.14 (Dept. D) percentage. Lower dials all clear to zeros, if work has been done correctly.
- Note: If machine is to be used for checking this type of work, both upper and lower dials can be locked. Then upon completion, upper dials will show 100.00 as proof and lower dials will clear to zero for further proof. Approximate time for this entire problem, including writing answers, is 40 seconds. (Excerpt of A. S. B. No. 513)

TEST "H"

- DECIMAL SET-UP Upper Dials 3 Change Lever @ X
 Keyboard 5 2 Change Control Lock Down
 Lower Dials 5 Transfer Slide O
- Step 1 Set 10.000.01 on keyboard. Depress SU key. Lock C Lever.
- Step 2 Set 15200. on extreme left of keyboard. Depress plus bar. Set 6240. at 5th decimal on keyboard. Depress minus bar.
- Step 3 Copy 8960 from lower dials directly to keyboard. Depress X key. Clear upper dials only.
- Step 4 Set 60. on extreme left of keyboard and 2.18 on extreme right of keyboard. Hold plus bar down until it locks. Depress divide key. Upper dials show 149.334 representing 149 bushels and the decimal .334 represents 20 pounds, using Grain Table (Form 550-S). Lower dials show 4 0325. 54812. A decimal marker can be placed between 9 and 10 to show the operator to ignore remainder 4 at left of marker. Money result is 325.54 (Half-cent not picked up if they are buying). (Excerpt of A.S.B. No.515)

MACHINE SERVICE BULLETIN NO. 440-D TEST "J"

- 1 With the carriage in the first position and the non-repeat key depressed, add all digits of keyboard using all "l's" then "2's" etc. through "9's". Subtract out and repeat this operation several times using various combinations of figures.
- 2 Repeat above test with carriage out of first position. NOTE: On this and test #1, be sure to hold plus and minus bars depressed to determine if machine stops after one cycle.
- 3 Depress the plus and minus bars slowly to determine that the clutch yoke moves into engagement with the transmission before the keys reach their downward limit.
- 4 With the non-repeat key depressed, operate the plus and minus keys alternately, letting the keys restore upward slowly to determine if the plus-minus rocker shaft latch relatches in the notch of the yoke positioner.
- 5 Repeat test #3 and #4 using upper and lower shift keys. While making this check, be sure that shift toggle "breaks" before the clutch yoke engages the transmission.
- 6 Depress the shift keys sufficiently to "break" the shift toggle but not enough to engage the clutch yoke. Release the shift keys and check to see that they are not blocked against re-depression.
- 7 Stroke the plus and minus bars sharply (quick-stroke) to see that the clutch yoke does not disengage from the transmission before the completion of the cycle. Make this same test using shift keys.
- 8 Using the master keyboard clear key, check for the upward releasing of all numeral keys and a full downward restoring of zero keys.
- 9 Check for safe releasing of numeral keys from depression of other numeral keys.
- 10 Hand cycle the machine off-center and check to see that numeral keys are locked against depression.
- 11 Check for proper clearing of upper and lower dials, clearing all "l's", "2's" etc. through "9's".
- 12 Depress each individual clear key slowly and check to see that the key goes down freely and that the clear drum makes only one cycle, also on a slow release of the key determine that the clearing cycle does not repeat.
- 13 After releasing any clear key slowly, re-depress the key to see that the clear trip link is not held blocked by latch (T2), Page 33.
- 14 Simultaneously, depress all clear keys slowly and check for free depression of keys, i.e. to see that the clear trip link is not released too soon by any clearing slide to the extent that the link moves forward prematurely to the left of any clearing slide thus causing hard depression of any clearing key.

Page 119

MACHINE SERVICE BULLETIN NO. 440-D TEST "J"

- 15 Depress the plus key with a full keyboard of "9's" with carriage in first position and then make set-ups (using set-up key) of various combinations of figures to determine that correct amounts are being set-up into the multiplier dials and that the carry over is not being added to any multiplier dial.
- 16 With carriage out of first position, make set-ups (using set-up key) of various combinations of figures to determine that proper amounts are being set-up in the registering dials and that the "1" is being removed from the upper dials.
- 17 With carriage in first position and #2 tab key depressed, make several division set-ups (using C.P. Set-Up and Dial Clear Keys) to determine that the carriage stops at the proper position and that the correct amounts are set-up into registering dials. Repeat this operation with #3 tab key depressed, then #4 etc. through #9. NOTE: When making the above check, alternate between quick and slow depressions of C.P. Set-Up Key to see that the function is correct regardless of the touch.
- 18 With the carriage out of first position, depress C.P. Set-Up Key alone to see that the return lever is not blocked against downward movement by the right-hand extension of shift reversing swivel. Test with index plate in its forward and rearward positions.
- 19 With carriage to extreme left, and all tab stops up and index plate forward, depress C.P. Set-Up and Dial Clear Keys and immediately re-depress keys (while carriage is shifting) to see that shift key is not pulled downward the second time when carriage reaches extreme right-hand position.
- 20 Repeat test #19 with carriage to extreme right and index plate rearward to determine that shift key is not pulled down again when carriage reaches the extreme left-hand position. NOTE: If shift key is pulled down a second time using tests #19 and #20, check to see that the shift disabler latchs over and under the flexible end of the shift control bar during a bumper stroke.
- 21 The following test should be made with the change lever rearward, change control lever forward, repeat key down and all tab keys up.
 - A With all "l's" on keyboard, depress minus bar then set-up key (with carriage in first position).
 - B Move constant lever to its "down" position.
 - C Lock all "1's" on keyboard using master keyboard clear key.
 - D Depress "CX" key and when carriage returns to first position, release constant lever and depress "-X" key.
 - E At completion of "-X" count-out, depress the C.P. Set-Up and Dial Clear Keys after checking to see that upper and lower dials are at zero.
 - F When carriage returns to the first position and "l's" are setup into multiplication dials, depress all "l's" on keyboard and then depress the "X" key.
 - G At the completion of a multiplication count-out, re-depress all "l's" on keyboard and divide. Result: All dials and the keyboard should be cleared.

MACHINE SERVICE BULLETIN NO. 440-D TEST "J"

This test will determine the following:

- a. Proper functioning of "-X", "X" and "CX".
- b. Holding and releasing of constant amounts.
- c. Proper functioning of automatic division.
- d. Automatic clearing of keyboard after multiplication and division.
- e. Proper setting of non-repeat and repeat keys on C.P. set-up and multiplication operations.
- f. Proper functioning of C.P. set-up on multiplication set-up operations.

Repeat the above operations using "2's", "3's", etc. through "9's".

- 22 With the transfer slide to the right, lock a constant of "l" in the first multiplier dial and depress the "CX" key. Check to see that the carriage shifts one place to the right, returns to first position and that the constant of "l" resets into multiplier dial.
- 23 Lock a constant of "l" in the second multiplier dial and depress the "CX" key to see that carriage does not shift beyond this column after the count-out, that carriage returns to the first position, that constant of "l" fully resets and that multiplier trip latch latches safely over trip rocker offset. Repeat this test with "l" locked in the third multiplier dial, then fourth dial etc. through the tenth position.
- 24 With a constant of "1" locked in the first multiplier dial, multiply using the "CX" key. Make this test with the transfer slide in every position to determine that carriage stops at the position indicated by the transfer slide and to see that carriage shift does not stop at zero columns.
- 25 With transfer slide positioned all the way to the left and a "1" locked in the first column of the keyboard, with repeat key down and all dials (including multiplier) cleared, depress the minus bar. Then depress "X" key and as the carriage is shifting to the right, depress the dial clear keys. When the carriage reaches the extreme right-hand position, depress the division key. Repeat this test at least fifteen times and alternate the position of the change control lever on each test. This test is to check the operation of the machine intermediate gears in all positions and the proper functioning of the change lever and change control lever in automatic division.
- 26 Check to see that the transfer lever relatches over the subcarriage shift lever if the transfer lever is moved to the left with the carriage in first position.
- 27 Perform several transfer operations to see that the correct amounts are transferred to the multiplier dials, that transfer lever is safely relatched over sub-carriage shift lever during plus set-up cycle and that storage gears do not nip on the lower dial intermediate gears as the carriage returns to the first position.

Page 121

Pages 123 to 127 inclusive contain composite illustrations of CAA mechanism to supplement the drawings furnished in the foregoing. These composite illustrations are provided to determine the relationship of an individual part or group of parts to an entire mechanical movement.

Circled numerals indicate pages of this bulletin containing function and adjustment data pertaining to the sections indicated by arrows.

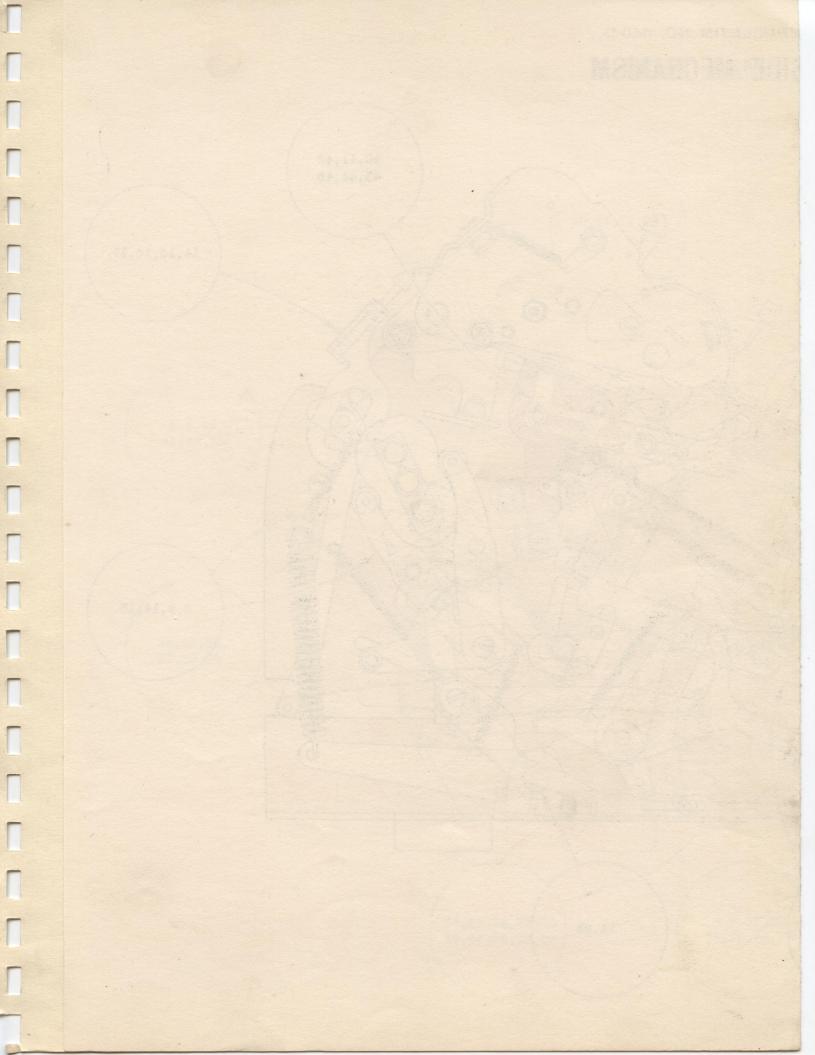
The illustrations on pages 67,123,124,126 and 127 may be requisitioned in larger size for use as Wall Reference Guides in branch office service departments.

When ordering Wall Reference Guides, kindly consult the chart below to identify illustrations.

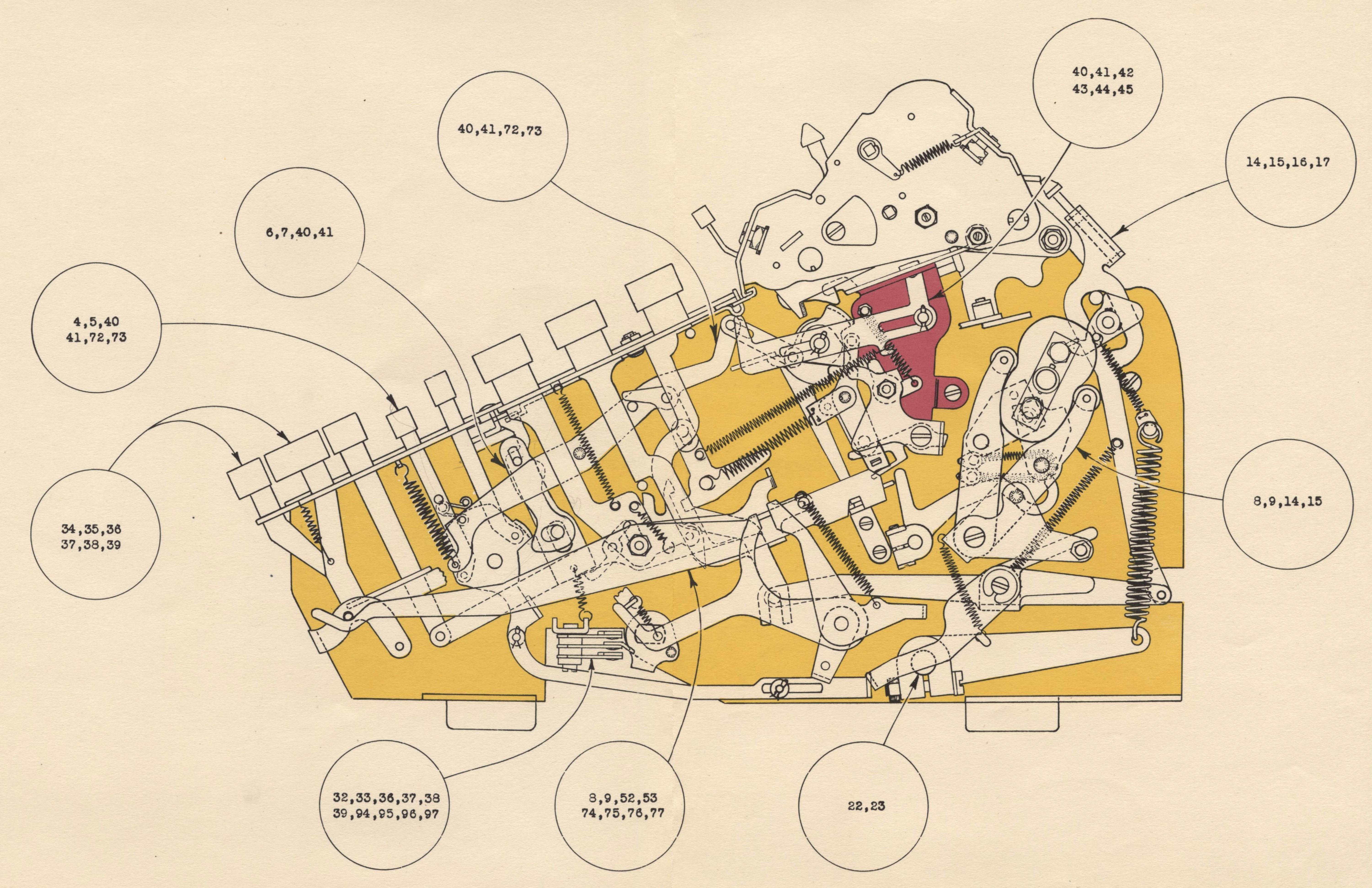
ILLUSTRATION IDENTIFICATIO	N	MECHANISM SHOWN
W.R.G. #1	-	R.H. Side Mechanism
W.R.G. #2	-	L.H. Side Mechanism
W.R.G. #3	-	Division Mechanism
W.R.G. #4	-	Multiplication Mechanism

Trip Mechanism

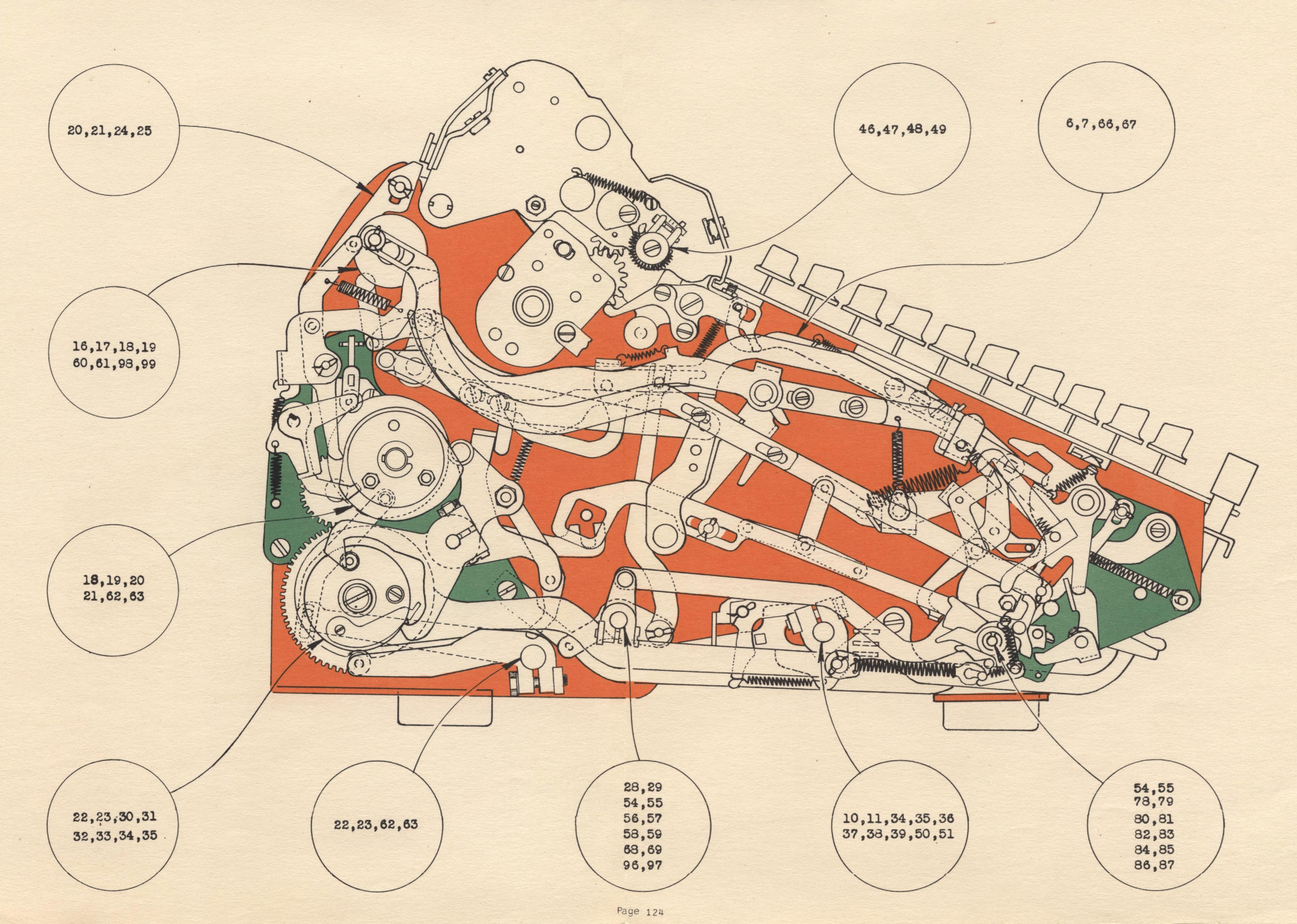
W.R.G. #5



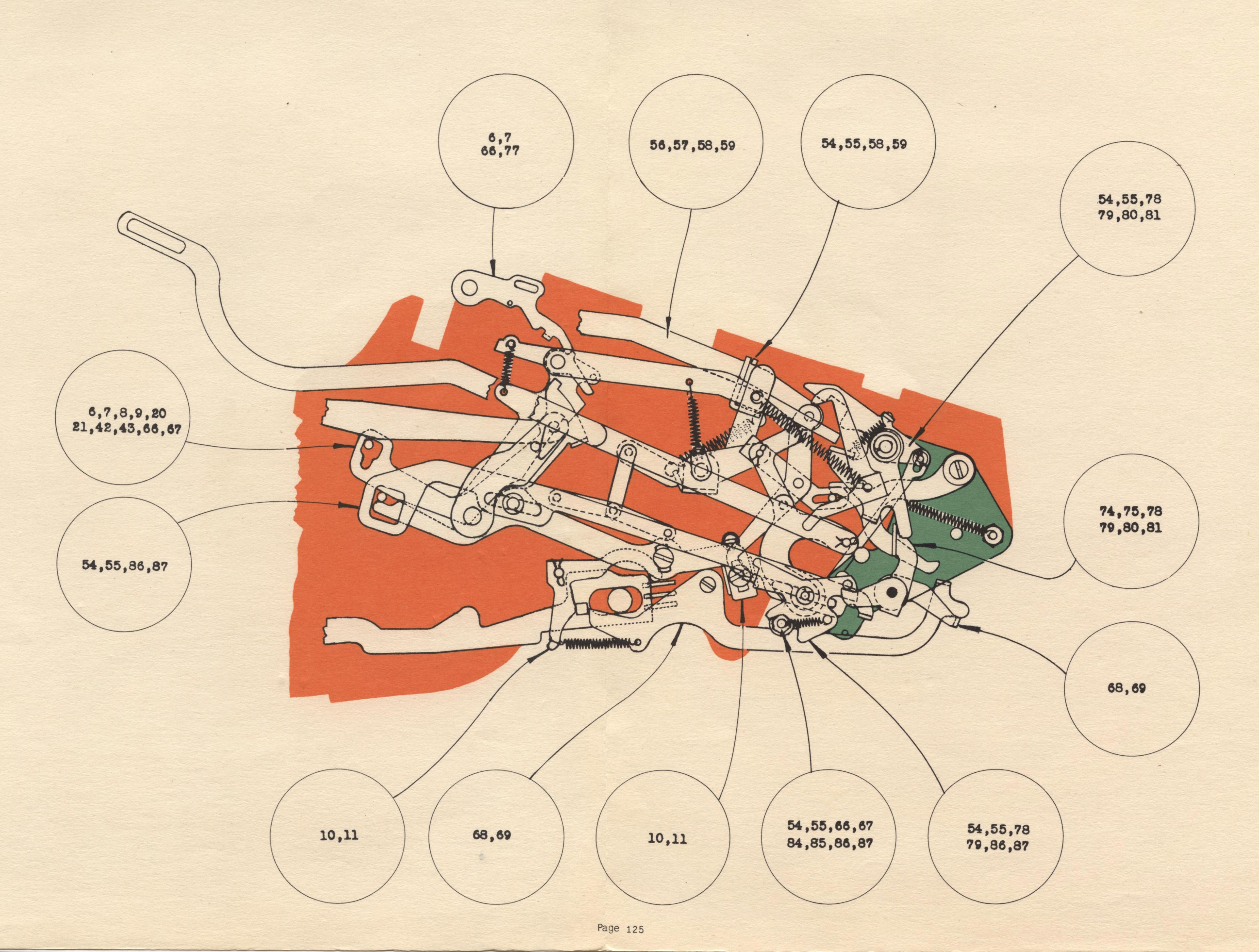
RIGHT HAND SIDE MECHANISM

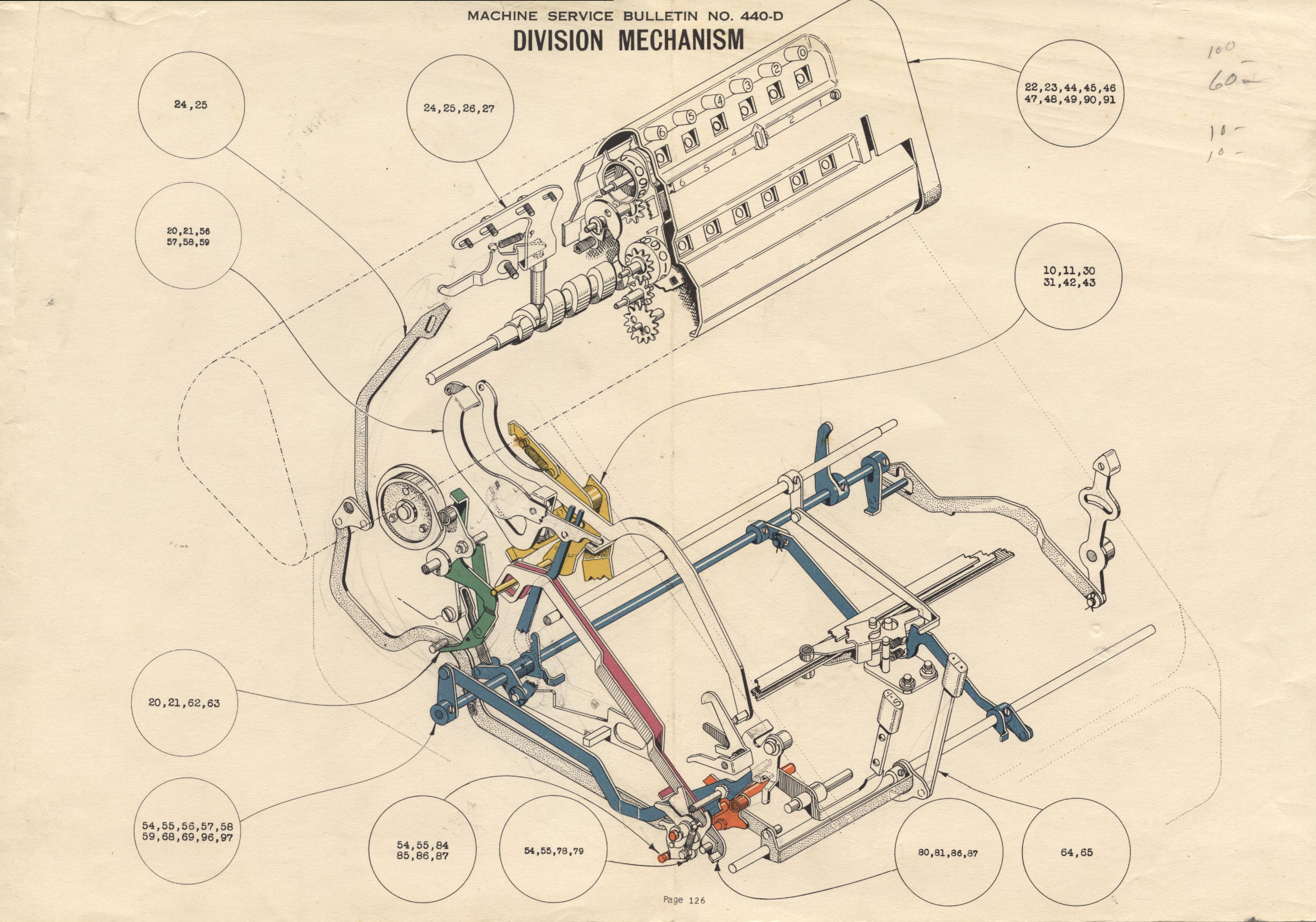


LEFT HAND SIDE MECHANISM

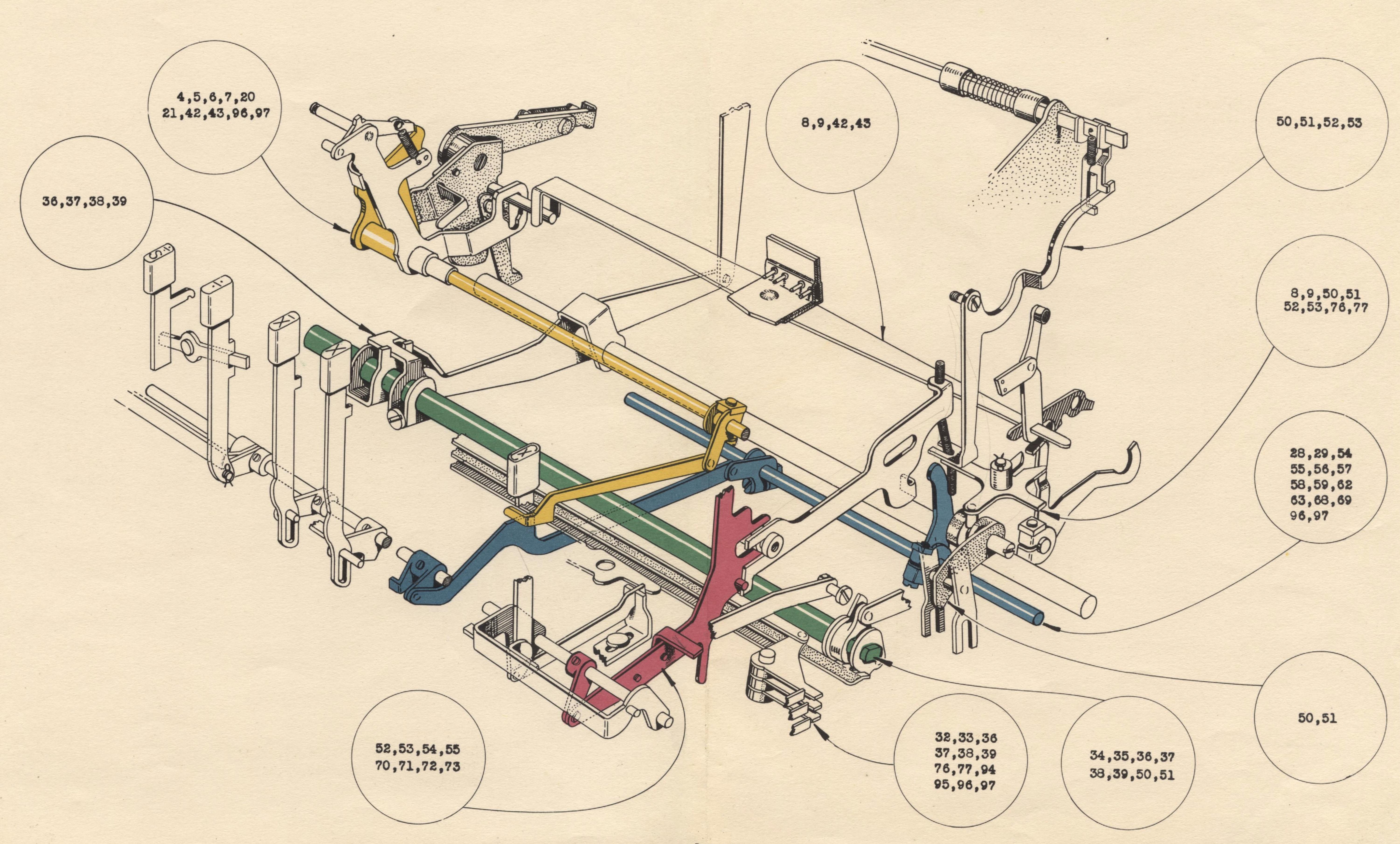


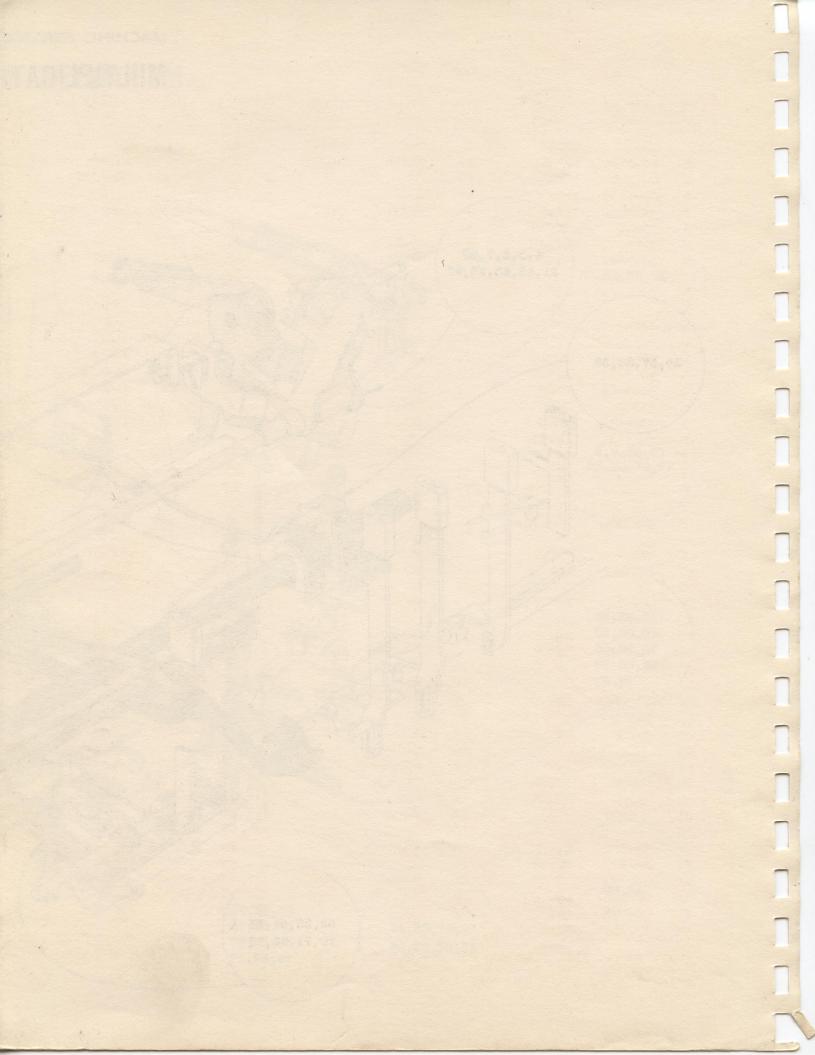
LEFT HAND SIDE MECHANISM





MULTIPLICATION MECHANISM





LETTER		PART NAME	LETTER SYMBOL	PART NO.	PART NAME	LETTER SYMBOL	PART NO.	PART NAME
A	2823	LATCH	Al	67052	LEVER	F1		
В	40-774xla	LEVER	AZ	67222	LATCH	T2	57509	SCREW
C	60-781	YOKE	A3			F3	60-7245	BRACKET
D	60-710g	SHAFT	14		108 25	F4		
B	67200	CLAMP	A5	67243	LEVER	F5	60-7252	ARM
	67642	ROCKER	16			F6		
	2971	SCREWS	17			F7		2
	60-7191	POSITIONER		1		18	67100	LEVER
J	00 22241	CT TDB	49	28411	HUB	F9		
	60-11142	SLIDE	DI	60-7301	ARM	G1	60-7103	ARM
L	44309	ARM	B1 B2	67391	NUT	G2	67464	CAM
	66103	ARM	B3	60-7124	LINK	G3	60-7463	DRUM
* P	60-7085	LEVER	B4	67126	ARM	G4	67101	LATCH
Q	60-7083	CLAMP	B5	0,100	-	G5	60-7251	BRACKET
R	60-770	SHAFT	B6	1017	SPRING	G6	2602	ROD
S	63750	GRAR	B7	50508	SCREW	G7	60-7475	HOUSING
T	60-7258	LEVER	B8	47119	BRACKET	G8	67370	NUTS
Ū	60-9090	ROCKER	B9	60-798xl		G9		
V	50508	SCREW						
W	67265	LEVER	Cl			Hl	883	SPRING
X	50508	SCREWS	C2			H2	57084	PAWL
Y			C3	67650	PLUNGER	H3		
1	60-7255	LEVER	C4	60-7238	SHAFT	H4	67125	ARM
			C5	60-7178	LEVER	H5	60-7128	LINK
AA	67569	SCREW	C6	59588	SCREWS	H6	50508	SCREW
BB	67172	ROCKER	C7	60-7094	PAWL	H7		
CC			C8	60-7002		H8		
DD	60-7177	LEVER	C9	66090	PLATE	Н9		
EE					1.38	*	ama43	OWITE
FF	2610	CAM	D1	60-7246	LOCATOR	J1	67641	STUD
GG	60-7083	LEVER	DE	60-6069	LEVER	J2	40 5443	DDIM
* HH			D3	69560	STUD	J3	60-7463	DRUM
JJ	40 4514	600	D4			J4 J5	60-7099	ROLLER
KK	60-4346	CAM	D5			J5 J6	67095	CAM
LL	60-7246	LOCATOR	D6	67291	LOCK	J7	60-7461	DRUM
MM	64052	ARM	D7 D8	67348	LOCK	18	2971	SCREW
* NN PP			D9	60-4000		19	60-5078	
QQ	67050	LEVER		00-10008	W1384 1			2101721
RR	67564	SCREW	El			K1	55371	NUE
SS	01002	201011	E2	60-7224	ARM	K2	60-6076	ARM
TT			E3			K3	67056	LINK
UU	60-4050	SHAFT	E4	60-7477	DISC	K4	67004	
VV	2878	SCREW	E5			K5	60-7081	
MM			E6	67244	LINK	K6	67590	SCREW
XX	60-9085	ROCKER	E7			K7	60-7068	
YY	60-772	ARM	E8			K8		
22	27-716	BRACKET	E9			К9		

Blank spaces following symbols designate that parts cannot be requisitioned or that symbol refers to a slot, extension, clearance, lug, etc. *Letters I and O are not used due to their similarity to numerals "one" and "zero".

LETTER	PART	PART	LETTER	PART	PART	LETTER	PART	PART
SYMBOL	NO.	NAME	SYMBOL	NO.	NAME	SYMBOL	NO.	NAME
1B	60-3560	GEAR	30	2004	CODWING			
2B	69750	GEAR	1G	2006	SCREWS	1M		
3B	60-5072	PLATE	2G 3G	67140	PAWL	2M		
4B	00-5072	FLAIR	4G			3M	67641	STUD
5B	57509	SCREW	5G			4M	67153	KEY
6 B	50509	SCREW	6G			5M	67151	KEY
7B	50509	SCREW			1386 24	6M		
8B	67183	LEVER	7G	00 B105	7.7397	7M	60-9094	ARM
9B	07100	TOAPU	8G	60-7165	LINK	8M	60-7121	ARM
9.0			9G			914		
10	67193	SLIDE	1H		1-48	1N	1256	ATTION
20	65059	CAM	2H	3182	SPRING	2N		NUT
3C	60-5120	DIAL	3H	67644	STUD		60-6078	PLATE
4C	60-9063	PAWL	4H	51820	SPRING	3N	67186	GUIDE
5C	69561	ARM	5H	01020	DENING	4N 5N	67212	ARM
6C	69000	SHAFT	6H				67219	ARM
70	60-6056	BRACKET	7H		1-64 35	6N	40000	0_0_ 0
80	67567	PIN	8H	67372	ROLLER	7N	67293	LOCK
90			9H	01012	RULLAR	9N		
			*			*		
1D			17	60-7110	ASSEMBLY	119	60-9073	ARM
2D			27	60-7164	ARM	2P		
3D			37			3 P	67152	KEY
4D	60-9070	COMB	4.7	2006	SCREWS	4P		
5D			5J	60-6089	BRACKET	5P	67302	LATCH
6D	60-9046	LOCK	6J			6P		
7D			73	67144	ARM	7P		
8D			8J	60-7235	LINK	8P	60-7271	ARM
9D	60-9062	LEVER	9J			9P	67009	SHAFT
9 70							100	
18			1K	60-7234	LATCH	10		
2E	#E040		2K	67230	LINK	2Q	60-7205	SLIDE
	65068	BRACKET	3K			3Q		
	65061	DISC	4K		200	40	67570	STUD
	60-7060	KEY &	5K			5Q		
	60-7061	KEY	6K	59566	STUD	60		
	67201	ARM	7K			79		
	60-7073	ARM	8K			80	67199	LOCK
8E 9E		100 E	9K	60-7231	ARM	90		
20		MEG 55	11					
1F	60-9079	SLIDE	2L		Line to the last	1R	60-7090	SLIDE
2F		DILUB		67990	TTME	2R		
3F		•		67229 4749	LINK	3R		
4F					SCREW	4R	60-8062	ARM
	69089	LATCH		67170	ARM	5R	68801	SPRING
	65560	SCREW		67169	LINK	6R	67228	LOCK
	59088	BAR	7L 8L			7R		
/ 8		13M PS	241			95		
	55560	SCREW		67130	ARM	8R 9R		

LETTER	PART NO.	PART NAME	LETTER SYMBOL	PARI NO.	PART NAME	LETTER	PART NO.	PART NAME
Ll			Rl	60-7123	LOCK	W1		
L2			R2			. W2		
L3	60-7093	LINK	R3	67339	ARM	W3	66062	KEY
14	66104	ARM	R4	28414	HUB	W4	60-7064	LEVER
L5	65803	SPRING	R5	60-7294	LATCH	W5		100
L6	28414	HUB	R6	60-7174	ARivi	W6		
L7	67203	ROCKER	R7			W7	67066	CLAMP
L8	67221	LINK	R8	67272	LATCH	W8	60-7181	SLIDE
L9	1256	NUT	R9	67500	STUD	W9		
М	60-5076	BRACKET &	sl	46640	SCREW	xı		
	60-5077	BRACKET	SZ	67341	PAWL	X2	60-7080	LEVER
M2	67658	PLUNGER	S3	0,011	- 2112	X3	60-7078	COUPLING
M3	01000	1 Donount	S4	60-7461	DRUM	X4	00-7070	COOL LING
M4	65000 1	SHAFT	S5	67562	STUD	15		
M5	60-5110	BRACKET	S6	01002	DIOD	X6		
M6	00-3110	DEMONIST	57			X7	60-7051	LEVER
M7			\$8			X8	00-7031	TPAPU
MS	58460	COLLAR	59	60-7071	LATCH	X9	60-9058	ARM
M9	65108	KEY	. 59	00-7071	LAIOH	70	00-9035	ARM
			Tl			Yl		
N1			T2			YZ		
N2			T3			Y3		
N3	60-8000 2	ASSEMBLY	T4	4109x2	KEYSTEM	Y4		
N4			T5	610512	BAIL	Y5		
N5	68390	CAM	T6	60-7171	LINK	Y6	67084	LINK
N6			T7	61560	SCREW	Y7		
N7	68391	CAM	T8	67465	ARM	Y8		
MS	68000	SHAFT	T9			Y9	60-2750	GEAR & CAM
N9	60-8053	LEVER			B . #			
			U1	60-7075	ARM	Zl	60-9050	CAM
P1	68350	COLLAR	U2	2761	SCREW	Z2	65080	PLATE
P2			U3	60-7088	LINK	23		
P3			U4	60-7075	ARM	24		
P4	60-7112	ARM	U5	67000	SHAFT	25	56809	SPRING
P5	60-7006		U6	67062	LINK	Z6	67182	ARM
P6	67105	LINK	U7	60-7059	ARM	27		
P7			U8	L-9726	SCREW	Z8	1256	NUT
P8			U9	66062	KRY		2671	SCREW
P9						Z9		
			V1	60-7065	LEVER			
Q1	67111	LATCH	V2			14	60-7184	ARM
Q2			V3	60-7130	SLIDE	21		
Q3	60-7268	ARM	V4	67067	CLAMP	34	59836	SPRING
Q4 .	60-6060	LEVER	V5	i entre		44		
Q5			V6	60-7079	COUPLING	5A		
Q6			77		18 H	6A	60-5000	SUB-CARRIAG
Q7			V8			7A .	60-5069	
28	60-7055	ARM	V9	60-7087	LEVER	84	1	9151
99	Acc.		200.5		30	94		
1100	7							

LETTER	PART NO.	PART NAME	LETTER SYMBOL	PART NO.	PART NAME	LETTER	PART NO.	PART NAME
							18	2100000
18	67518	STUD	1X	60-9075	LEVER	AW		
25			2X	60-9080	LINK &	AX		
38				60-9081	LINK	AY		
45			3X	1389	NUTS.	AZ		
58			4X			4 4		
68	67082	BLANK	5X	66561	SCREW	BA	60-7054	LATCH
75	50508	SCREWS	6X	67168	BRACKET	BB	67172	ROCKER
88			7X			BC		
95			8X	60-7114	LINKS	BD		
			9X	60-7001 2	SHAFT	BE	60-7467	ARM
1T			- 22.			7 200		
21	69059	LEVER	14					
3T	67152	KEY	2Y	67566	STUD	1 1000000000000000000000000000000000000		
4T			3Y	66070	LEVER			
5T	60-7278	BAIL	4Y					
6T	1464	SCREWS	5Y	60-9065	FINGER	T.S. ac		
7T			6Y					
8T	60-9071	BAIL	7Y					
9T	1464	SCREW	8Y	67190	LATCH			
			94					
10								
ZU	67153	KEY	12					
3 U			2Z	60-9055	FINGER			
40			3Z	60-9053	FINGER			
5U			42	60-6064	BRACKET			
6U			52					
7U	67296	ARM	6Z					
8U	60-7270	LEVER	72	68801	SPRING			
90			8Z	63352	COLLAR	100,000		
			9Z	60-2640	CAM	3778		
17			355					
27			AA	67569	SCREW	1 11.17		
37			AB	69390	CAM			
47			AC					
57			AD			15.3		
6V	60-7156	LEVER	AE			104.5		
77	67127	LATCH	AF					
87			AG					
97			_ AH					
			AJ	67280	BRACKET			
lW	67152	KEY	AK	60-7282	PLATE			
2W	60-7113	BAIL	AL	67284	CAM	\$70.40g c		
3W	60-9082	LINK &	AM					
	60-9083	LINK	AN	e earn		10.00		
4W	2882	SPRING	* AP	60-7283	CAM	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		
5₩			AQ	60-7290	PAWL			
6W	60-7262	ARM	AR	60-7285	LINK			
7 W	1389	NUTS	AS		200			
8₩			AS	60-1052	SLIDE			
911	69078	LATCH	AU	60-7289	CLAMP			
	MAMILI	AMEL WILL						

